A1.1 COMPARATIVE ANALYSIS OF TERRITORIAL POLICIES ON IAS MANAGEMENT

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INTRODUCTION

This document represents the second part of activity A1.1 of the INVALIS project, funded by the Interreg Europe Programme. The aim of Activity A1.1 "Comparative analysis of territorial policies on IAS management" is to examine and comparatively analyze the existing policies on the detection and management of Invasive Alien Species (IAS) policies in partnership territories and beyond. All partners have gathered input from their own country and ICETA has investigated the policies in EU28. The activity will conclude with highlighting all key aspects of successful policies for the control and/or eradication of invasive alien species.

Biological invasions are considered to be one of the greatest threats to the biodiversity and natural ecosystems. Invasive Alien Species (IAS) can act as vectors for new diseases, cause native species' extinction, change ecosystem processes, and reduce the value of land and water for human activities.

The European Commission defines invasive alien species as (European Commission, 2018):

"…animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences for their new environment. They represent a major threat to native plants and animals in Europe, causing damage worth billions of euros to the European economy every year. As invasive alien species do not respect borders, coordinated action at the European level will be more effective than individual actions at the Member State level."

The document begins by presenting the methodological approach that was designed as well as the methods of this research. In particular presents data collection methods consisted in the conduction of desk research and data analysis methods which eventually comprised the use of descriptive statistics and the open coding method for data derived from open-ended questions. Nevertheless, the comparison of distinct policies was conducted according to specific criteria such as the following:

- The first criterion aims to evaluate whether or not proposed policy measures are congruent with European Union policies against the introduction and establishment of IAS. Congruence has a double meaning in this case.
- The second criterion aims to evaluate the applicability and transferability of each policy measure.
- The third criterion aims to evaluate the impact of policy measure.

Furthermore, the document deciphers the principal results from data collection from project partners and provides a presentation of their policies on the prevention, detection, control and management of IAS.

The fourth section offers a description of different EU Member States for the identification, prevention and management of IAS in Europe, prepared by ICETA.

The fifth section aims to provide information regarding additional IAS systems that are applied, and can be considered as good practice guide and best practices. In particular four innovative cases are presented, employing high capacity technological tools and software.

The sixth section, presents the concluding findings on IAS management policies and regulations. It compares and contrasts the input provided by Project Partners in order to provide the most common issues and the most crucial differences concerning the implementation of similar or different IAS management systems throughout Europe. Additionally, this section focuses on awareness raising which is considered as highly important for the promotion, encouragement and motivation for efficient IAS management, and presents the main conflicts of interests occurring for the management of IAS.

The final section provides guidelines in order to strengthen the IAS management status and ensure that legislation is appropriately enforced, protocols and procedures are in place, and operations towards the effective management of IAS are sufficiently implemented by Project Partners and EU Member States in general.

1. METHODOLOGICAL APPROACH

As described in the INVALIS A1.1 Methodology, IAS management, prevention, identification and control are perceived and addressed as policy measures. Policy measures are used to refer to actions taken by public organizations to control a specific system of functions within their jurisdiction, to resolve problems within it or caused by occurrences in it, or to help obtain benefits from it. The latter was highly considered in order to proceed to a comparative analysis of IAS management in the EU.

Comparative analysis is roughly defined by the following characteristics:

1. An attempt to analyse and explain the observed similarities and differences between cases.
2. The collection of data on two or more cases, ideally according to a common framework

   The primary reason considered in the A1.1 Methodology in order to perform comparative analysis, is the explanatory interest of gaining a better understanding of the causal processes involved in the production of an event, feature or relationship, in the case of public policy, the effects of the latter on specific issues.

1.1. Data collection:

The A1.1 Methodology has presented specific research questions and has defined the approach in order to edit precise data collection methods that can provide sufficient data for answering the questions. According to the latter, data collection was divided in two parts:

- **Part 1** consists of data collection within the region and the country of each INVALIS partner. Each member of the INVALIS consortium has gathered from his own region and country data capable of answering the research questions. The basic method INVALIS partners used to collect data was secondary internal and external desk research. Furthermore research has been conducted using different sources such data consisting on documents available online and retrieved from external desk research. This source of

data was used throughout the three parts of data collection. An alternative source was using internal documents of the INVALIS partners.

- **Part 2** consists of gathering adequate data from EU member states not being represented in the INVALIS consortium, and was conducted by ICETA.

1.2. Data analysis, evaluation and methods

INVALIS partners have analyzed the data derived from desk research, developing a detailed account of specific policies that are a) related to the objectives of the policy instruments that correspond to each partner, b) related to other additional major policy goal in relation to confronting the invasion of alien species.

The data analysis is based on a combination of the open coding method, a criteria-based evaluation and descriptive statistics. According to the A1.1. Methodology researchers had to identify, note and code all patterns that emerge from the data, even if they contradict the researchers' assumptions. To achieve this, an input form was used as a tool for data collection processes by INVALIS partners including open ended questions capable of delivering descriptions of the characteristics of policy measures for the control of IAS.

To avoid reaching stagnation, further questions were implemented allowing for carrying out a comparison of policies based on specific criteria. Consequently, concerning the INVALIS A1.1 activity, partners had to analyze the results of desk research so as to find which policy measures satisfy the following evaluation criteria:

The **first criterion** aims to evaluate whether or not proposed policy measures are congruent with European Union policies against the introduction and establishment of IAS. Congruence has a double meaning in this case. If the measure under the evaluation is a single action, then congruence means that it a) conforms to the components of relevant EU-widely applied policies, and/or b) it builds upon and complements these policies so as to achieve a more holistic protection of the environment and economy from IAS. If the measure under evaluation comes in the form of a multi-faceted policy, addressing all the issues of confronting

IAS, then congruence means that it includes actions that cover all aspects of hindering the invasion of alien species, as reflected in European Union policies.

The **second criterion** aims to evaluate the applicability and transferability of each policy measure. This will be achieved by developing an understanding of the following factors:

1. How many kinds of IAS (from those listed as invasive by the EU) can be confronted by each measure, and in how many types of ecosystems is it applicable?
2. How many barriers are there for the application of each measure, and are there any enablers to ease their application and to foster their effectiveness?

The **third criterion** aims to evaluate the impact of policy measure. This will be determined by the extent of the application of each policy measure and its success so far, as defined by the decrease in the de novo introductions of IAS and the reduction of the populations of those already established.

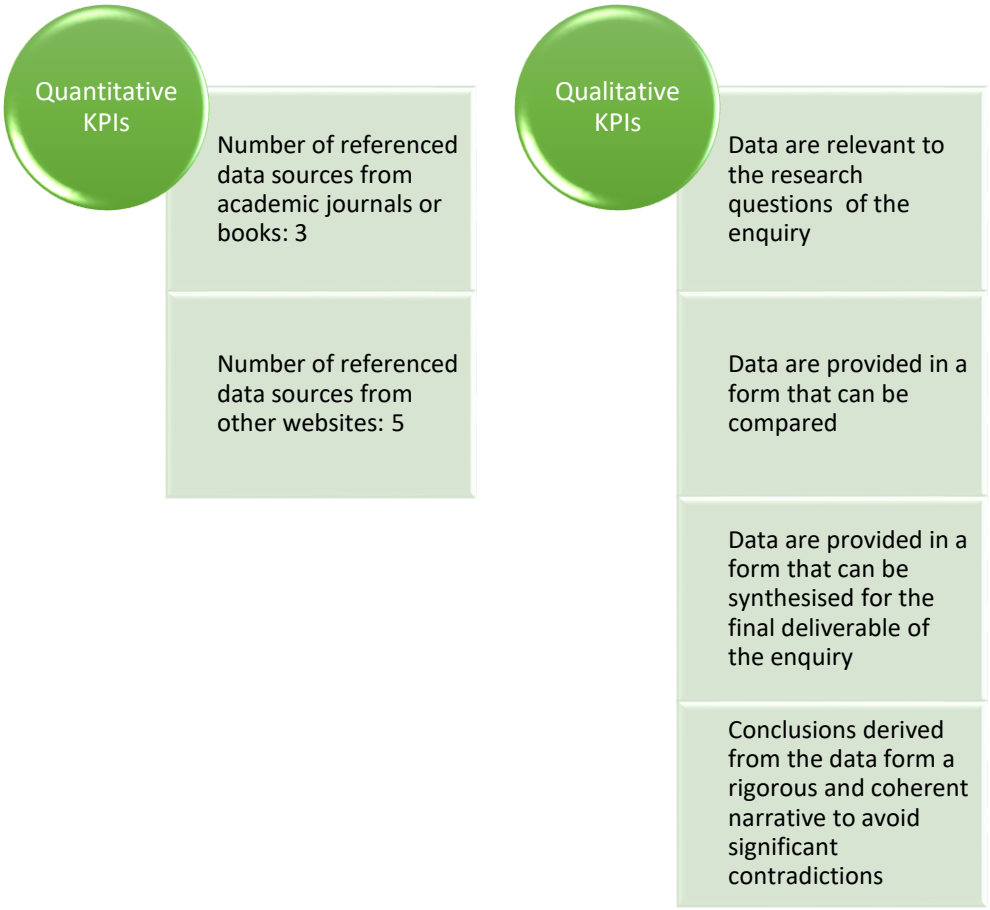
The aforementioned criteria are further articulated into specific evaluation questions that will determine whether or not a policy measure will be considered better than others. In the end, it is possible to synthesize a complete picture of the most successful types and aspects of policies that address the issue of IAS. On the contrary, this analysis allows for an open evaluation and interpretation of the answers to the questions allowing to manage to compare case-specific policies.

What is more, since these evaluation questions will not be open-ended but instead utilize lighter scale and multiple choice/response formats, descriptive statistics are utilized to present quantitative descriptions of participants' information in a manageable form that simplifies the large amount of data gathered.

1.3. Quality specifications

To achieve the aims of this research, it was necessary for the INVALIS partners to abide by specific quality criteria. Quality criteria for this research comprise according to the A1.1 Methodology a number of quantitative and qualitative key performance indicators. The following figure presents the key performance indicators per partner for INVALIS activity A1.1.

Figure 1 Key Performance Indicators



2. THE IAS REGULATION (1143/2014)

To proceed to the analysis of the findings from the data collection, it is important to provide an insight on the EU IAS Regulation 1143/2014. The following table, which was introduced by ICETA in the INVALIS A1.1 Comparative baseline analysis on IAS territorial policies (EU-28), summarizes the basic articles of the above mentioned regulation. The regulation became EU law with a view to promoting the harmonization of existing Member States' frameworks for containing IAS and to extending and deepening the set of measures aimed to deal with the complex predicament of non-native species' introduction to fragile ecosystems. The table cites the basic articles which lay out the three major dimensions of IAS management, namely, prevention, early detection and eradication, emergency measures, horizontal (cross-sectoral synergies), as well as reporting measures brought forth with implementation regulations in 2017, for the harmonization of data input and the development of interoperable databases throughout the EU.

Art. 4 List of invasive alien species of Union concern	**4. Member States may submit to the Commission requests for the inclusion of invasive alien species on the Union list. Those requests shall include all of the following: (a) the name of the species; (b) a risk assessment carried out in accordance with Article 5(1); (c) evidence that the criteria set out in paragraph 3 of this Article are met. 5. The Union list shall make reference, where relevant, to the goods with which the invasive alien species are generally associated and their Combined Nomenclature codes as provided by Council Regulation (EEC) No 2658/87 (1), indicating the categories of goods that shall be subject to official controls pursuant to Article 15 of this Regulation. 6. When adopting or updating the Union list, the Commission shall apply the criteria set out in**

	paragraph 3 with due consideration to the implementation cost for Member States, the cost of inaction, the cost-effectiveness and the socioeconomic aspects. The Union list shall include as a priority those invasive alien species that: (a) are not yet present in the Union or are at an early stage of invasion and are most likely to have a significant adverse impact; (b) are already established in the Union and have the most significant adverse impact. 7. When proposing the Union list, the Commission shall also justify that the objectives of this Regulation are better achieved by measures at Union level.
Art. 5 Risk assessment	Whenever a Member State submits a request for the inclusion of a species on the Union list it shall be responsible for carrying out the risk assessment referred to in paragraph 1. Where necessary, the Commission may assist the Member States in the development of such risk assessments in so far as it relates to their European dimension.
PREVENTION	
Restrictions	Member States shall take all necessary steps to prevent the unintentional introduction or spread, including, where applicable, by gross negligence, of invasive alien species of Union concern.
Permits	Member States shall establish a permit system allowing establishments to carry out research on, or ex-situ conservation of, invasive alien species of Union concern. Where the use of products derived from invasive alien

	species of Union concern is unavoidable to advance human health, Member States may also include scientific production and subsequent medicinal use within their permit system.
Authorisations	In exceptional cases, for reasons of compelling public interest, including those of a social or economic nature, Member States may issue permits allowing establishments to carry out activities other than those set out in Article 8(1) subject to authorisation by the Commission, in accordance with the procedure laid down in this Article and subject to the conditions set out in Article 8(2) and (3).
EMERGENCY MEASURES	
Article 11 Invasive alien species of regional concern and species native to the Union	Member States may identify, from their national list of invasive alien species of Member State concern established in accordance with Article 12, species native or non-native to the Union that require enhanced regional cooperation.
Article 12 Invasive alien species of Member State concern	Member States may establish a national list of invasive alien species of Member State concern.
Article 13 Action plans on the pathways of invasive alien species	Member States shall, within 18 months of the adoption of the Union list carry out a comprehensive analysis of the pathways of unintentional introduction and spread of invasive alien species of Union concern at least in their territory //2. Within three years of the adoption of the Union list, each Member State shall establish and

	implement one single action plan or a set of action plans to address the priority pathways it has identified pursuant to paragraph 1 // 3. Member States shall ensure coordination with the aim of establishing one single action plan or a set of action plans coordinated at the appropriate regional level // 4. The action plans referred to in paragraph 2 of this Article shall include, in particular, measures based on an analysis of costs and benefits, in order to: (a) raise awareness; (b) minimise contamination of goods, commodities, vehicles and equipment by specimens of invasive alien species, including measures to tackle transportation of invasive alien species from third countries; (c) ensure appropriate checks at the Union borders, other than the official controls pursuant to Article 15. 5. The action plans established in accordance with paragraph 2 shall be transmitted to the Commission without delay. Member States shall review their action plans and transmit them to the Commission at least every six years.
EARLY DETECTION AND RAPID ERADICATION	
Surveillance system	Within 18 months of the adoption of the Union list, Member States shall establish a surveillance system of invasive alien species of Union concern, or include it in their existing system, which collects and records data on the occurrence in the environment of invasive alien species by survey, monitoring or other procedures to

	prevent the spread of invasive alien species into or within the Union.
Article 15 Official controls	By 2 January 2016, Member States shall have in place fully functioning structures to carry out the official controls necessary to prevent the intentional introduction into the Union of invasive alien species of Union concern
Article 16 Early detection notifications	Member States shall use the surveillance system established in accordance with Article 14 and the information collected at official controls provided for by Article 15 to confirm early detection of the introduction or presence of invasive alien species of Union concern. 2. Member States shall without delay notify the Commission, in writing, of the early detection of the introduction or presence of invasive alien species of Union concern and inform the other Member States, in particular of: (a) the appearance on their territory or part of their territory of any species included on the Union list whose presence was previously unknown in their territory or in part of their territory; (b) the re-appearance on their territory or part of their territory of any species included on the Union list after it has been reported as eradicated.
Article 17 Rapid eradication at an early stage of invasion	After early detection and within three months after the transmission of the early detection notification referred to in Article 16, Member States shall apply eradication measures and notify those measures to the Commission and inform the other Member States.

	2. When applying eradication measures, Member States shall ensure that the methods used are effective in achieving the complete and permanent removal of the population of the invasive alien species concerned, with due regard to human health and the environment, especially non-targeted species and their habitats, and ensuring that animals are spared any avoidable pain, distress or suffering. 3. Member States shall monitor the effectiveness of the eradication. Member States may use the surveillance system provided for in Article 14 to this effect. The monitoring shall also assess the impact on non-targeted species, as appropriate. 4. Member States shall inform the Commission of the effectiveness of the measures taken and notify the Commission when a population of an invasive alien species of Union concern has been eradicated. They shall also provide that information to other Member States.
Article 18 Derogations from the obligation of rapid eradication	
MANAGEMENT	
Article 19 Management measures	1. Within 18 months of an invasive alien species being included on the Union list, Member States shall have in place effective management measures for those invasive alien species of Union concern which the

	Member States have found to be widely spread on their territory, so that their impact on biodiversity, the related ecosystem services, and, where applicable, on human health or the economy are minimised. // 4. The surveillance system provided for in Article 14 shall be designed and used to monitor the effectiveness of eradication, population control or containment measures in minimising the impact on biodiversity, the related ecosystems services and, where applicable, on human health or the economy. The monitoring shall also assess the impact on non-targeted species, as appropriate.
Article 20 Restoration of the damaged ecosystems	1. Member States shall carry out appropriate restoration measures to assist the recovery of an ecosystem that has been degraded, damaged, or destroyed by invasive alien species of Union concern unless a cost-benefit analysis demonstrates, on the basis of the available data and with reasonable certainty, that the costs of those measures will be high and disproportionate to the benefits of restoration.
HORIZONTAL PROVISIONS	
Article 21 Costs recovery	In accordance with the polluter pays principle and without prejudice to Directive 2004/35/EC of the European Parliament and of the Council (1), Member States shall aim to recover the costs of the measures needed to prevent, minimise or mitigate the adverse impact of invasive alien species, including environmental and resources costs as well as the restoration cost.

Article 22 Cooperation and coordination	1. Member States shall, when complying with their obligations under this Regulation, make every effort to ensure close coordination with all Member States concerned and, where practical and appropriate, use existing structures arising from regional or international agreements. In particular, Member States concerned shall endeavour to ensure coordination with other Member States that share:
Article 24 Reporting and review	1. By 1 June 2019, and every six years thereafter, Member States shall update and transmit to the Commission the following: (a) a description, or an updated version thereof, of the surveillance system pursuant to Article 14 and of the official control system on alien species entering the Union pursuant to Article 15; (b) the distribution of the invasive alien species of Union concern or regional concern in accordance with Article 11(2) present in their territory, including information regarding migratory or reproductive patterns; (c) information about the species considered as invasive alien species of Member State concern pursuant to Article 12(2); (d) the action plans referred to in Article 13(2); (e) aggregated information covering the entire national territory on the eradication measures taken in accordance with Article 17, the management measures undertaken in accordance with Article 19, their effectiveness, and their impact on non-targeted species; (f) the number of the permits referred to in Article 8 and

	the purpose for which they were issued; (g) measures taken to inform the public about the presence of an invasive alien species and any actions that citizens have been requested to take; (h) the inspections required under Article 8(8)
Article 25 *Information support system*	
Article 26 *Public participation*	
2017/1454 REGULATION specifying the technical formats for reporting by the Member States pursuant to Regulation (EU) No 1143/2014 of the European Parliament and of the Council	*Article 1* The technical formats to be used by the Member States for transmitting to the Commission the information pursuant to Article 24(1) of Regulation (EU) No 1143/2014 are set out in the Annex to this Regulation
2018/968 supplementing Regulation (EU) No 1143/2014 of the European Parliament and of the Council with regard to risk assessments in relation to invasive alien species	

3. RESULTS – PRESENTATION OF PARTNERS' POLICIES

The three criteria presented earlier in 1.3 will guide the presentation of the results and the deciphering of partners' policies and implemented measures and regulations on the management of IAS. This section will provide a description deriving from input provided by project partners for their countries.

3.1 National Center for Environment and Sustainable Development EL

Criterion 1:

The policy under evaluation, assessing every problem that might occur during the procedures of IAS management and consequently addresses the delay in implementing EU Regulation 1143/2014, as well as the lack of progress in implementing **Article 12 of the main Biodiversity Law in Greece (Law 3937/2011)**. The latter requires the drafting of a national list of IAS and the adoption and implementation of appropriate plans for their efficient management. The policy is definitely multidimensional and in terms of prevention, it comprises a number of compulsory restrictions imposed upon the deliberate introduction of IAS or upon any actions that could unintentionally introduce them.

In addition, the policy includes a system for granting permits, comprising methods and criteria, for the introduction of IAS under controlled conditions when there are specific economic, social or health-related reasons. Early detection and rapid eradication policies, in this case, include the establishment of a surveillance system of IAS, which engages procedures collecting and recording data on the in the environment of IAS by employing surveys, monitoring etc. The policy similarly introduces a system of official controls applied to the production and trade of precise categories of goods so as to minimize any possibility of introduction of new IAS and eradicate any small populations that have already been established.

Finally, regarding the management of IAS which have already been spread to some extent, Greek policies firstly include lethal or non-lethal physical, chemical or biological actions aimed at the eradication, population control or containment of a population of an IAS. Secondly,

policies contain appropriate restoration measures to assist the recovery of an ecosystem that has been degraded, damaged, or destroyed by IAS, unless a cost-benefit analysis demonstrates, on the basis of the available data and with reasonable certainty, that the costs of those measures will be high and disproportionate to the benefits of restoration.

The Greek partners have noted that Greece is currently at a very low level of implementation of Regulation 1143/2014, however it is expected to form the basis for applying the EU regulation in Greece. The policy involves the finalization of a legal act (in the form of a Joint Ministerial Decision) that will set the framework for the implementation of Regulation 1143/2014. Additionally, an outsourced project will:

(a) Provide a database of all IAS that have already been accounted in current bibliography;
(b) Categorize these IAS by pathway of introduction and risk level;
(c) Identify knowledge gaps that need to be filled through field research;
(d) Propose an ongoing monitoring system;
(e) Perform a "horizon scan" to identify potential future invasions of IAS;
(f) Propose management plans;
(g) Propose a draft national list of IAS.

Criterion 2:

To begin with, the Greek form indicates that the policy's objective is to identify all species currently spotted in the country, as well as possible future invasions, but there is no specific number provided. Nevertheless, the policy addresses both terrestrial and marine ecosystems. If appropriately evaluated, all diverse ecosystems that are considered in the form, will be protected, except from ice-associate marine habitats that do not exist in the INVALIS's partnership countries.

From an economic point of view, the policy's potential negative impact on the economy is estimated to be small, as the policy will not involve the actual implementation of management measures at this stage. Therefore the costs will involve administration and research/monitoring, which are not significant, compared to the expected economic impact

of the actual management actions that will follow up on the current policy. The outsourced project examined here is co-funded by the EU, reaching a total budget of €150.000.

Furthermore, there are multiple barriers constraining the implementation of the policy under evaluation. More specifically, excluding shortage and inaccessibility of scientific information, all other barriers of the form are applied (see ANNEX). The implementation of such policies in Greece has not been promoted to any significant extent, therefore the current effort can be described as an entryway to all future policies. As such, it faces all entrance-barriers such as lack of existing expertise and lack of existing framework and infrastructure to build upon. This affects both the administrative and technical levels. On the scientific level, there has been a lot of work published in recent years. This knowledge still needs to be aggregated and made accessible in order to inform regarding the available IAS policies in the most effective manner.

Nonetheless, there are few enablers facilitating the application of the policy under evaluation, which may include existing bodies of scientific research, and may also entail the fact that other member states implementing the EU regulation can share their expertise. Furthermore, it is important that a monitoring system is already in place, within the framework of the Natura 2000 protected sites network. Consequently, IAS monitoring could be incorporated in this existing monitoring framework.

Criterion 3:

The policy demonstrated above, has not led to new introductions of IAS, while the population or diffusion of the latter has not decreased at all, as it is still at its infancy and therefore no results have been produced or outcomes evaluated. The attitude towards positive or negative impacts on the economy of the territory is rather neutral and this is also explained by the embryonic state of the policy. The same trend is visible for social impacts in the territory.

3.2 Lombardy Foundation for the Environment IT

Criterion 1:

According to the Lombardy Foundation for the Environment, in both the region and country, the **Legislative Decree 230/2017** (DLg 230/2017 hereafter), in compliance of the national legislation with the provisions of regulation (EU) no. 1143/2014 of the European Parliament and of the Council of October 22th, 2014, has introduced several measures in order to reduce the introduction and the spread of IAS. The DLg 230/2017 specifically prohibits the following:

- Introduction or transit in the Italian territory;
- Detention;
- Rearing and cultivation;
- Transport;
- Selling or marketing;
- Use, assignment free of charge or exchange;
- Reproduction or spontaneous growth;
- Release into the environment.

On the other side, the DLg 230/2017 also introduces a series of permits to warrant the botanical gardens, zoos and research institutions the holding of IAS of Union concern for specified activities (e.g. research activities or for reasons of particularly public interests).

Moreover, a surveillance system by regions with the support of ISPRA (The Italian Institute for Environmental Protection and Research), is set up in order to monitor the national territory with the aim to immediately notify the appearance or re-appearance of IAS in regional territories.

Once the detection of an IAS is confirmed, the DLg 230/2017 establishes the obligation of a timely eradication of its populations. The eradication activities are ordered by the MATTM (Italian Ministry of Environment and Protection of the Territory and the Sea), with the active support of ISPRA, and must be carried out by the Regions and the Autonomous Provinces concerned, or by the National Parks. Mayors shall guarantee access to private land for intervention operators when this is necessary to achieve eradication.

The aforementioned Decree also regulates any exception from the obligation of timely eradication, the emergency and management measures for IAS already occurring or at risk of introduction into the Italian territory, measures to restore damaged ecosystems and cost recovery.

Another point introduced by the DLg 230/2017, is the obligation to report the detention of specimens of IAS and transitional provisions for non-commercial owners and commercial stocks.

The official controls at the Customs, Entry Points pursuant to Legislative Decree 214/2005 (in the case of plant species) and Frontal Inspection Posts (PIF) (in the case of animal species) are regulated and the obligations for importers or their representatives in customs are established.

The Policy as multifaceted, follows almost all policy aspects included in the input form. What is not followed, is firstly, a system for granting permits, including methods and criteria, for the introduction of IAS under controlled conditions, when there are specific economic, social or health related reasons and secondly, a system of official controls. Concerning the policy aspects for the whole country, Italy follows all of them.

Moreover, considering that Lombardy region has in its territory 36 out of 50 IAS of union concern, and considering also the high ecosystem variability, the Lombardy experience in managing IAS could be significantly useful also to improve the EU regulation. At a national level, the Legislative Decree provides the possibility of adopting a list of IAS of national concern, to which apply the same provisions and prohibitions foreseen for the IAS of the EU.

This list can be progressively updated also on the basis of further requests of Regions. To present the policy under evaluation, it is firstly noteworthy that the regional law 10/2008 has been entered into force since 2008 in Lombardy. Two black lists of IAS (one for animal species and one for plants) that must be object of monitoring and eradication have been compiled. These lists were approved by the DGR 8/7736 in 2008 and the same law also forbids the introduction of alien species of plants, invertebrates, amphibians in the regional territory.

Furthermore, the regional law 86/1983 indicates that the managing body of the area are responsible for the eradication of the IAS in the protected areas and the sites of Natura 2000 network. In order to satisfy the requirements of the EU Regulation 1143/2014 and the Italian Decree 230, Lombardy proposes a few strategies against IAS that mainly focus on the early detection, eradication and management of IAS using the triage approach. Following this method, it should be possible to define the order of intervention according to the characteristic of the species, their impacts on the biodiversity and their capability of dispersion in the regional territory. Furthermore, this approach also considers the level of difficulty in the process of eradication and control of the species. Using this method, it is possible to classify IAS according to their level of invasiveness and, as consequence, decide which type of action should be necessary to use.

Moreover, other two important aspects are considered in the strategies: the improvement of awareness on the problems that IAS cause to the ecosystems and how to restore an ecosystem in order to favour the presence of native species (habitat restoration process). In particular, Lombardy has recently produced two strategies on the management of IAS: one on *Trachemys scripta* and another on *Sciurus carolinensis*.

Both of them focus their efforts on the eradication and management of these species. Furthermore, another strategy focuses on the restoration of the habitats suitable for the native species of crayfish *Austropotamobius pallipes*; this strategy also implicates the eradication of the other 4 species of alien crayfish. Regarding the IAS plants, there are 6 pilot areas in the region where different techniques of eradication against IAS are put to test. The species involved in the project are: *Elodea nuttallii, Lagarosiphon major, Saururuus cernuus, Reynoutria spp., Persicaria filiformis, Heracleum mantegazzianum, Asclepias syriaca and Myriophyllum aquaticum.*

Furthermore, at a national level, on 30 January 2018, the Legislative Decree n. 230/2017 of "Compliance of the national legislation with the provisions of regulation (EU) no. 1143/2014" was published[1].

The Legislative Decree 230/2017 guarantees a full compliance with the provisions of the EU Regulation, identifying that the institutional subjects involved at different levels against IAS, are the Italian Ministry of Environment and Protection of the Territory and the Sea (MATTM), the Italian Institute for Environmental Protection and Research (ISPRA), Regions, the Autonomous Provinces and the National Parks.

The task to complete the EU's list of species with other species of national interest has been initiated in March 2019, designing the prioritization and horizon scanning process, necessary to build up such an additional list.

Criterion 2:

Lombardy has controlled 12 species through the policy and has provided a list of these IAS. The policy addresses only terrestrial ecosystems, and therefore ecosystems that could be protected are the following:

1. Inland surface waters
2. Mires, bogs and fens
3. Grasslands and land dominated by forbs, mosses or lichens
4. Woodland, forest and other wooded land

[1]Text in Italian is available at:

http://www.gazzettaufficiale.it/atto/serie_generale/caricaDettaglioAtto/originario?atto.dataPubblicazioneGazzetta=2018-01-30&atto.codiceRedazionale=18G00012&elenco30giorni=false

5. Constructed, industrial and other artificial habitats

At a national level, both terrestrial and marine ecosystems are addressed, while only ice-associated marine habitats are not protected through the policy.

Regarding the economic impact, it can be inferred that at the time being, it is considerably early to describe a possible economic impact because the Decree has only been recently approved. However, a moderate impact is estimated for the whole country on specific sectors such as fish farms, plant nurseries, garden centers or pet shops. In case of need of eradication, the costs may be much greater.

In addition, the main barriers emerged during research and confirmed by regional stakeholders, are related to various aspects of the protection of the ecosystems from the invasion of IAS. The first barrier that emerged is a general lack of public awareness of and basic knowledge about IAS. It is fundamental to adjust the level of information: the importance of communication/citizen science projects, school environmental education or in site visits led by naturalist experts are crucial for the success of any action. Meetings and events with citizens and politicians, ought to be encouraged as well.

Moreover, the few problems that emerged, are related to the organization of the early monitoring and alien species alert. The latter is triggered because of the difficulties in training staff to recognize alien species or the poor level of confidence on an early alert of new IAS. Another relevant barrier is the difficulty to access to the “hot area” of airports and the importance of having common legislation in all the European Countries to allow airport controls: one of the main pathways of species introduction and further dispersion. Finally, the last barrier is the difficulty of the Regional Agencies in enforcing the European policy, due to a general lack of funding related to the management of IAS.

Lombardy has identified a large number of enablers. In particular diverse projects aiming to improve the awareness of IAS. Indicatively, some projects are provided below:

- The Life ASAP project (https://www.lifeasap.eu/index.php/en/);
- The Life project Gestire 2020 (www.naturachevale.it);
- Life project Alta Murgia (http://lifealtamurgia.eu/).

- The Agency for the Protection of the Environment (ARPA) has developed a website that describes the impact of the alien plants (http://www3.arpalombardia.it/biodiversita/).

Finally, the Italian Universities involved in the studies of IAS determine an important role on the increasing of the knowledge on IAS.

Criterion 3:

At the moment, it is too early to evaluate whether the DLg 230/2017 has a direct impact on the introduction of new IAS. However, it should decrease the likelihood of new introductions and spread of IAS because it imposes several bans. Furthermore, it provides one or more action plans for addressing the main vectors of introduction of invasive alien species, aiming to reduce the risks of accidental introduction in Italy. Finally, it should indirectly favour all the projects that increase the IAS awareness.

The eradication, the management measures addressing the invasive alien species in the EU and measures to restore damaged ecosystems proposed in the regional strategies could contribute considerably to the reduction of IAS distribution.

Regarding positive or negative implications on the economy of the territory, no particular impact has been identified, while on the social impact, the increase of awareness is estimated to lead to a more responsible management of the Italian territory, as a whole.

3.3 Regional Ministry for environment and rural, agricultural policies and territory – Regional Government of Extremadura ES

Criterion 1:

The policy under evaluation in this document is **Royal Decree 630/2013**, of August 2, which regulates the Spanish Catalogue of Invasive Alien Species (IAS). This regulation modifies Royal Decree 1628/2011.

The objective of this Royal Decree is to regulate the Spanish Catalog of IAS, specifically to establish:

a. The characteristics, contents, criteria and procedures for the inclusion or exclusion of species in the Catalogue.
b. The necessary measures to prevent the introduction of IAS and for their control and possible eradication.
c. The characteristics and content of management, control and possible eradication strategies, against invasive alien species.

The territorial scope of the Royal Decree consists of the Spanish State territory and the marine waters subject to Spanish sovereignty or jurisdiction, including the exclusive economic zone and the continental shelf.

Policies found in the data are as in previous sections multifaceted and address the issue of IAS with most of the policy aspect provided in the form except from the development and application of rapid eradication of IAS procedures. Finally, policies for the management of IAS that are already spread are not addressed by this policy in Spain.

Furthermore, the approval of Royal Decree 1628/2011 in Spain, its update (RD 630/2013) and its implementation, have served as basic regulations for the subsequent drafting of European Regulation 1143/2014. The Royal Decree 630/2013 presents as advancement against the European Regulation, the existence of a broader Catalogue than the list of species generating concerns for the EU, which means that it covers a wider spectrum of species.

Describing the policy, the object of the Royal Decree 630/2013 is to regulate the Spanish Catalogue of IAS and establish, on the one hand, criteria and procedures for the inclusion or exclusion of species in the Catalogue. On the other hand, the Royal Decree aims to define the necessary measures to prevent the introduction of IAS, to control and possibly eradicate them.

Criterion 2:

Only 9 species are identified and included in the List of IAS of concern to the Union presented in the Autonomous Community of Extremadura (and which are also presented in the Spanish Catalogue of Invasive Alien Species). These species are the following: *Eichhornia crassipes, Ludwigia peploides, Myriophyllun aquaticum, Pacifastacus leniusculus, Procambarus clarckii, Pseudorasbora parva, Trachemys scripta, Vespa velutina sub. nigrithorax, Alopochen aegyptiaca.*

The policy under evaluation addresses IAS spread in both terrestrial and marine ecosystems and almost all of them are protected, ice-associate marine ecosystems excluded (as in previous sections as well).

As far as the economy is concerned, the approval of RD 630/2013, far from causing a negative impact on the Spanish economy, has allowed to diminish the negative impact caused by bio-invasions. This can be seen, at the state level, with the containment of many of the exotic species already present in the territory, as well as in the prevention of new bio-invasions through border control or by the application of risk assessment. This has allowed a significant reduction in the cost of control and eradication work, the damages caused by hydroelectric and agricultural production, irrigation infrastructures or water purification, as well as the reduction of the impact on ecosystem services.

However, it is true that some sectors may initially be adversely affected after the approval of the Royal Decree, as is the case of trade in pets and live plants. In this sense, it has been observed that the wholesale companies of domestic animals and live plants have replaced the

exotic species prohibited by the regulations with new ones over time, so that this sector has not been finally damaged.

Obviously, those companies dedicated to culture or breeding of IAS included in the Spanish catalogue (American bullfrog, golden apple snail, etc.) had to reconvert or modify their activity. An exception to this regulation is the case of mink breeding farms which may maintain its activity, and even open new farms, as reflected in "Sixth additional provision. Industrial or commercial facilities that hold species included in the catalog."

It should be noted that implementing the evaluated policy has generated costs for the Administration itself to address this threat with the hiring or assignment of its own staff to manage IAS together with the inherent costs of the control / eradication work of these species.

Regarding the barriers, 4 out of 9 barriers (see ANNEX) have been indicated by the Spanish partner for the policy under evaluation. In particular, it has been stated that there is still low awareness and great lack of knowledge regarding the IAS' impact. Furthermore, it is noted that IAS pose a serious threat for biodiversity's conservation and public health. Consequently, attitudes and behaviors that promote the introduction and spread of these specimens continue to be maintained. However, a great effort is being made by Administrations, NGOs, media and some foundations and research centers to raise awareness regarding IAS.

Furthermore, inadequate monitoring capacity has been selected. This is pointed out not because it represents an impediment itself for the policy implementation, but because of the need of knowledge about IAS' distribution and their subsequent control actions in order to implement an effective strategy. For this reason, it is considered as necessary to have full-time staff dedicated to this work, which should not be defined as punctual and costly due to the large number of species to be monitored. Thus, in the absence of this full-time staff, citizen and sector alert networks are being established, in an alternative way, and at a low cost (through observation registers, either by email or through mobile applications).

Moreover, a quick response to a bio-invasion is one of the great handicaps of fighting against IAS. The lack of budget, the rigidity of the contracting systems, the inaction before the

fulfillment of competences and the little interest of some governors prevent the implementation of quick response structures to stop bio-invasions in its initial stages. It would be necessary to annually establish fixed budget items allocated to the management of these species. In order to comply with the European Regulation, it would be necessary to establish the obligation for member states to have these rapid response structures with staff and allocated budgets.

Finally, Junta de Extremadura has stated a lack of coordination between some competent Administrations in the field of environmental management, other state administrations (hydrographic confederations, responsible for communication routes) and key sectors that make the implementation of Royal Decree 630/2013 less effective than expected. However, there is an Iberian Working Group on IAS in Spain that is promoted by the Ministry of Ecological Transition (MITECO), maintaining a connection between the different regional and some State-level administrations, related to water management and the communication routes.

Another element evaluated is the existence of enablers. In Spain, competent entities at the state and regional level could be established as the enabling entities for the implementation of this policy. Thus, we can point out the different Autonomous governments, hydrographic confederations responsible for the management of watersheds, and Ministries responsible for environment, coasts and communication routes (roads, highways, railways) management and border control as enabling entities to implement this regulation.

In the Autonomous Community of Extremadura, the Junta de Extremadura through the General-Directorate for the Environment, as a focal point for IAS management, and the rest of the General-Directorates, the Guadiana Hydrographic Confederation, the Tagus Hydrographic Confederation and the Ministry of Development and state forces (Civil Guard SEPRONA and Military Emergency Unit) are the main enabling entities to implement the Policy to be evaluated.

Criterion 3:

The application of Royal Decree 630/2013 in Extremadura has avoided new IAS introductions as well as the establishment of others. This has occurred through:

• Reduction by more than 60% the number of ads of IAS' illegal sale on the Internet in Extremadura.
• Installation of systems for boats cleaning and disinfection by the Hydrographic Confederations of Guadiana and Tajo in Extremadura.
• Establishment of early detection systems (systems of periodic larvae analysis and the installation of ropes for adult detection) against zebra mussels in several reservoirs with high risk of invasion.
• Delivery of more than 70 IAS specimens included in RD 630/2013 by owners.
• Non-existence of IAS for sale in specialized establishments in Extremadura since 2015.
• Collaboration of several Administrations in IAS management.

Furthermore, the Royal Decree's (630/2013) implementation has favored the reduction or eradication of some IAS populations in Extremadura. Specifically, control works are being carried out against the invasive species *Neovison vison*, which is decreasing its population size, mainly in one of the most sensitive areas of Extremadura, due to the presence of the endangered species *Galemys pyrenaicus* that is affected by IAS.

The presence of the invasive species *Procyon lotor* was early detected, capturing the existing specimen and eradicating its presence. Work has been carried out on the control of the species *Trachemys scripta* in two of its most important populations in Extremadura, reducing its strength by more than 500 specimens.

At the state level, we must also point out some successful developments in the population reduction or almost eradication of some IAS. This is the case of the monk parakeet (*Myiopsitta monachus*) in the city of Zaragoza, where a population of over 6.000 specimens had been identified and recorded. Such population has currently disappeared due to the control and eradication work carried out by the Government of Aragon and the City of Zaragoza through the implementation of the evaluated policy. We can also point out the case of the eradication

of common water hyacinth (*Eichhornia crassipes*) in the Valencian Community due to its implementation by the Generalitat Valenciana.

Then, the implementation of RD 630/2013 has favored, both at the state and regional level, the population reduction of some IAS and therefore their spread throughout the rest of the territory. However, it is necessary to make effort between the different Autonomous Communities for the development of coordinated and simultaneous works, to improve the obtained results.

Regarding positive or negative impacts on the economy of the territory, the impact in this case has been significantly positive, especially when taking into account the high costs of allowing the expansion of a bio-invasion and job creation.

A scientific study entitled as: "Estimation of the costs of the invasion of the zebra mussel in the Ebro basin (period 2005-2009)", was carried out to assess the economic impact of the invasion of the zebra mussel (*Dreissena polimorpha*) in 2012. The above study showed that the economic estimate of the impact made by a previous study in 2005 (Pérez and Pérez & Chica, 2006) had multiplied by almost 150, which shows that inaction can generate a huge economic impact. For this reason, control and eradication works sponsored by Royal Decree 630/2013 have reduced the costs of controlling some of the most problematic species. However, it should be noted that this economic impact is only reduced when long-term control campaigns are constantly carried out each year. Otherwise, IAS populations can return to the initial situation, or even worse, the species can spread even more.

On the other hand, IAS management entails job creation to carry out control, raising awareness and management work. As a specific case, in Extremadura the Guadiana Hydrographic Confederation has invested 41 million euros in works of control of common water hyacinth, of which 70% has practically been directed to staff hiring with the consequent impact on the local economy.

Regarding positive and negative social impacts on the territory, social impact generated by the implementation of the RD 630/2013, has been quite controversial given that a very necessary but also unknown by civil society normative was applied. Information regarding the

policy that would allow an objective opinion about it was not available at the time of its implementation.

If we analyze general social, there is understanding and receptiveness, regarding IAS eradications such as Asian clam (*Corbicula fluminea*), the zebra mussel (*Dreissena polimorpha*) or floating primrose-willow (*Ludwigia peploides*), for which there is an understandable negative impact and society does not share an affective bond or specific sensitivity. However, for those species with which an affective bond (i.e.: any exotic pet) or certain sensitivity is maintained due to the proximity in the ecological scale (i.e.: *Neovison vison*), or by tradition (i.e.: *Acacia dealbata*). It is the case of Seville (Spain), where the elimination of specimens of *Myiopsitta monachus* could not carried out due to the pressure of animal groups, frustrating the control of this species.

Some sectors such as hunting and sport fishing, which base their activity on hunting and fishing a large number of invasive alien species, have shown the greatest reluctance to accomplish the RD 630/2013. Similarly, fur farms sector has exerted a great pressure on the elaboration of this policy. Consequently, establishment of new farms is allowed in Spain. Therefore, the approval of any normative related to the IAS must be preceded by a campaign to raise awareness of general society specific sectors.

3.4 Corsican Agency of Environment FR

Criterion 1:

The policies under evaluation for the Corsican participants are two Orders adopted on the 14th of February 2018 on the prevention of introduction and spread of invasive exotic animal and plant species in metropolitan France. The principal problem of IAS related to policies is the importance of the existence of efficient tools for risk assessment and management of the introduction, considering as well the issue of insularity. Both Orders comprise a multifaceted policy. According to the data from the survey, all aspects from prevention policies, early detection and rapid eradication policies and policies for the management of invasive alien species that are already widely spread, are addressed by the Orders. The latter is estimated to be further developed and optimize significantly the EU Regulation. Given the specific difficulties for both animal and plant species, the application of European regulations remains too partial. The intervention should be homogenized with a regulatory base in order to integrate the specificities of the island territories.

Describing the policy's implementation it is noteworthy that given the EU framework has been transcribed at national level via various laws and strategic action plans to be declined at local level. Nevertheless, the latter still remains problematic as insularity has been clearly taken into account only for the overseas territories, while for Corsica, the application of the free movement of merchandises and people has a negative impact on the implementation of effective non-introduction measures, despite targeted procedures such as the authorization and declaration systems, regionalized lists etc.

Criterion 2:

The policy under evaluation aims to confront two large categories of IAS; animals and plants. Concerning animals the policy can confront 866 non-native species including 45 invasive species, while concerning plants, the policy can strike 1682 non-native species including 42 invasive species. Consequently the policy addresses the IAS diffusion in both terrestrial and

marine ecosystems covering all types of ecosystems included in the documentation form, ice-associated marine habitats excluded.

In addition, Corsican partners have stated that the policy bears a moderate negative impact on the economy. The most crucial issue relates to the damage to agricultural or horticultural crops and the reduction in the levels of production. Progressively, the introdution of new varieties of breeds could impact the genetic heritage of endemic breeds and therefore alter the economic fabric linked to the exploitation of the latter (AOP bees, for instance).

The implementation of the policy under evaluation is constrained by a series of barriers. In particular 7 out of 9 barriers comprised in the form, hamper the implementation of the policy. Only two of the above mentioned barriers are not in place, and are related to the shortage and inaccessibility of scientific information (for species identification, risk analysis, detection and mitigation techniques etc.) and the absence of clear and agreed priorities for action.

More specifically, low public awareness on the risks associated with their purchases and behaviors, especially as the problem of the free movement of goods and people in Europe makes any control measure difficult. Additionally, there are few resources allocated to surveillance and inspection. Moreover, the multiplicity of internvention levels complicates even further the implementation of an effective policy measure in spite of the local will and opinion.

Regarding the activity of enablers as facilitators, several European programs such as INVALIS and ALIEM provide the framework to define additional means in order to deal with the IAS spread problem and to generate links between different stakeholders, raise awareness and control actions.

Criterion 3:

According to the Corsican partner, the policy under evaluation has led to a decrease to the de novo introduction of IAS, however there is no data available in order to enlighten further on that matter. Besides, the policy has not led to any decrease in the population/diffusion of IAS.

The lack of perception in terms of species monitoring, and the constant increase in the number of introduced species recounted on the territory, lead to a negative evaluation of the impact of the strategy, although the situation could have been even worse without any strategy. Regarding positive or negative impacts on the economy, the policy has led to some decline in garden plant sales, and therefore it can be inferred that the impact has been slightly negative. Finally, social impacts are unmeasured and therefore there is no feedback on this matter.

3.5 Bucharest- Ilfov Regional Development Agency RO

Criterion 1:

The IAS management policy, under evaluation in Romania is orchestrated by the **Order 979/2009.** The latter regulates the introduction of allochthone species, interventions on invasive species, as well as the reintroduction of native species listed in annexes no. 4A and 4B of the Emergency Government Ordinance no. 57/2007 on the regime of natural protected areas, conservation of natural habitats, wild flora and fauna, with subsequent modifications and additions, on the national territory.

The above mentioned Order is a single action policy instrument, which comprises a system for granting permits, including methods and criteria for the introduction of IAS under controlled conditions when there are specific economic, social or health related reasons.

The Ministry of Environment has last year signed the financing contract for the project "Proper management of invasive species in Romania, in accordance with the EU Regulation 1143/2014 on the prevention and management of the introduction and spread of IAS".

The project aims to create scientific and administrative tools, essential for the effective and operational management of IAS in Romania, in accordance with EU Regulation 1143/2014. The project aspires to identify IAS and search for appropriate measures for integrating the earlier identified species. The measures implemented by the project could be feasible by accessing European or national funds.

The principal characteristics of the Order 979/2009, are comprised in the following Articles:

Art. 4: ”The deliberate reintroduction of native species into natural and semi-natural habitats, respectively in protected natural areas, is permitted only on the basis of the environmental permit, with respect to reintroduction of indigenous species, issued by the competent authority for environmental protection, with the favourable opinion issued by the Romanian Academy, based on the data analysed and the certificate of genetic origin of the species, issued by a competent authority in the field, on a case-by-case basis , according with the

procedure established for the authorization of research and development activities, CAEN code 7310."

Art. 5:

(1) It is forbidden to deliberately introduce into Romania invasive species from outside the national territory.

(2) Exceptions to the application of paragraph (1) make:

a) introducing for research-development under isolation of invasive species, that is allowed only to legal persons fulfilling the conditions of isolation provided in Annex no. 2, according to the procedure established for the authorization of activities, CAEN code 7310;

b) Introducing for research and development purposes for ecological reconstruction of some habitats, which are not included in the network of protected natural areas, and are irreparably destroyed by anthropogenic factors or climate change.

(3) Reduction of the spreading area / Eradication of invasive species occurring accidentally or deliberately on national territory is permitted under the environmental permit for restriction of the spreading / eradication of invasive species released by the competent public authority for environmental protection, based on the favourable scientific opinion issued by the Romanian Academy, for each case, according to the procedure established for the authorization of the research and development activities, CAEN code 7310.

Criterion 2:

The list of IAS of Union concern that are reported in Romania, is published on the website of the aforementioned project "Proper management of invasive species in Romania, in accordance with the EU Regulation 1143/2014 on the prevention and management of the introduction and spread of invasive alien species". The IAS's list comprises 14 species, namely: *Asclepias syriaca, Cabomba caroliniana, Elodea nuttallii, Heracleum sosnowskyi, Impatiens glandulifera, Nyctereutes procyonoides, Ondatra zibethicus, Pennisetum setaceum, Eriocheir*

sinensis, Myocastor coypus, Orconectes limosus, Perccottus glenii, Pseudorasbora parva, Trachemys scripta.

In addition, the ecosystems that the policy under evaluations aspires to protect include regularly or recently cultivated agricultural, horticultural and domestic habitats, constructed, industrial and other artificial habitats, estuaries and coastal lagoons, as well as coastal habitats.

Furthermore, information regarding the economic impact of the policy on IAS management, is not easily reachable. On the contrary, it is certain that the Order faces a series of barriers that include low public awareness, shortage and inaccessibility of scientific information (for species identification, risk analysis, detection and mitigation techniques etc.), absence of clear and agreed priorities for action, lack of effective emergency response measures and outdated or inadequate legislation.

The policy under evaluation engages few enablers. Firstly, the Ministry of the Environment is the national authority in the fields of environmental protection, green economy, biodiversity, protected natural areas, climate change and has the role of synthesis, coordination, regulation, monitoring, inspection and control in these areas. Moreover, it carries out the precise strategy and regulations for development and harmonization of these activities within the general policy of the Government of Romania, ensuring and coordinating the implementation of the Government's strategy in its fields of competence. The legislative implementation is also assisted by the Local Environmental Protection Agency (LEPA).

In addition, the National Environmental Guard has responsibilities to control compliance and apply sanctions, while universities and research institutes could contribute by providing scientific data.

Criterion 3:

Criterion 3 is not developed as there is no available data neither for the decrease of *de novo* introduction of IAS, nor for a potential decrease in their population deriving by the enforcement of the Order 979/2009. Furthermore, there is no information available neither

for positive or negative impacts on the economy nor for negative social impacts of the policy in the systematic IAS management.

3.6 Institute of Sciences, Technologies and Agro-environment of the University of Porto PT

The management of IAS has been highly active in Portugal. Ten cases have been provided from the Portuguese partner, however only 3 meet with the criteria. The remaining 7 cases are found beyond the scope of this activity, which aims to include policies, and therefore are excluded from this analysis.

3.6.1 Decree-Law No. 565/99

Criterion 1:

This policy instrument indicates which non-indigenous species (i.e. exotic) may behave as invasive, prohibiting its installation and contains a list of forest tree species that can be used in nature. It was intended to condition the introduction of non-indigenous species, with the exception of those intended for the agricultural crops.

This regulation complies with the international obligations assumed by Portugal, in approving through ratification Decree No 95/81 of 23 July, the Berne Convention, by Decree No 103/80 of 11 October, the Bonn Convention, and by Decree No 21/93 of 21 June 2003 on the Biodiversity Convention, which advocates the adoption of measures conditioning intentional introductions and preventing accidental introductions, as well as controlling or eradicating species already introduced.

Furthermore, the Portuguese Basic Law of the Environment, Law No 11/87 of 7 April calls for the drafting of legislation suitable for the introduction of exotic specimens and adoption of measures of control, regarding the introduction of any wild, aquatic or terrestrial animal species. The territorial scope of this Decree is the continental and insular (Açores and Madeira) Portuguese territories. Its scope is multifaceted and addresses aspects 1, 2, 6, 9, 10, and given its national scope, it is much more likely to be enforced and known by stakeholders than European legislation.

Criterion 2:

48 Species can be confronted by this policy, which addresses both terrestrial and marine ecosystems. There are no data describing the economic impact but it is estimated to be small. Concerning the barriers, low awareness and great lack of knowledge are observed regarding the IAS impact. Hence, attitudes and behaviors promoting the introduction and spread of these species continue to happen. Nonetheless, some NGOs are making important efforts in increasing awareness of this issue. Only a few enablers are engaged. In particular, some city councils have promoted eradication campaigns. Prevention is being promoted by some NGOs at a national and regional level, but results are not available. Some schools have also been adopting this IAS issue to promote and discuss it throughout the school year to increase children awareness of this problem.

Criterion 3:

Furthermore, there are no concrete data on the effect of this legislation on the number of IAS introduction and spread. There are, however, media articles by some NGOs (FAPAS and ZERO) protesting the inefficiency of this legislation in Portugal. Considering the impacts on the economy of the territory and the social impacts, being perceived as not enforced, it can be assumed that its effect on the national economy has been neutral.

3.6.2 Plan of Action for the Vigilance and Control of Vespa velutina

Criterion 1:

This plan aims to frame the national action regarding the establishment and dissemination of the Asian wasp in mainland Portugal (*Vespa velutina nigrithorax*). This is a non-indigenous species, predatory to the European bee (*Apis mellifera*), currently circumscribed to the north of the country.

Detection or suspected presence of a nest or of *Vespa velutina nigrithorax* specimens shall be reported by diverse means including the completion of forms and the use of applications through smartphones. The policy plan is multifaceted as well and addresses the factors 5, 7, 8, 9 and 10, and it is estimated that stakeholders can contribute significantly to its enforcement.

Criterion 2:

Only *Vespa velutina* is tackled by the policy, addressing consequently terrestrial ecosystems and in particular woodlands, forests and cultivated domestic or not habitats. Also, given *Vespa velutina*, is a species with important economic relevance, as it destroys honeybees, it has important economic impacts on the regions. Nevertheless, there is still low awareness and great lack of knowledge regarding IAS impacts and the serious threat they represent for biodiversity conservation and public health. In this case, although local people know how dangerous this wasp is, many are still unaware of this plan, and of how it can be helpful in controlling the species' spread.

Criterion 3:

The latter can be reversed and local people among others can become enablers of this action plan. There are no data regarding new introductions or decrease in populations, while the same trend stands for impacts on the economy and social impacts.

3.6.3 Regional Plan for the Eradication and Control of Invasive Plant Species in Sensitive Areas

Criterion 1:

This plan aims to reduce negative impacts on the natural flora of the Azores resulting from species of invasive flora. It is multifaceted and addresses policy aspects 4, 8, 9 and 10, while its impact on the optimization of the EU Regulation is moderate. The plan includes the following actions:

- Inventory of vulnerable zones, with high natural value, and determination of the degree of infestation.

- Eradication of invasive alien species by applying an appropriate methodology the characteristics of each one of them and the natural habitat where they are.

-"In Situ" and "Ex-Situ" conservation through the restoration of natural habitats and populations that have been affected by the invasion of exotic species.

- Dissemination of the project through the media.

-Environmental promotion actions for different target audiences (population in general, schools and regional and local authorities), alerting the introduction of exotic flora.

- Evaluation of the project in the various phases.

- Monitoring in the years following the project.

Criterion 2:

This policy instrument tackles 17 IAS (i.e. Acacia melanoxylon, Ailanthus altissima, Arundo donax, Carpobrutus edulis, Clethra arborea, Cryptomeria japonica, Drosanthemum floribundum, Gunnera tinctoria, Hedychium gardneranum, Hydrangea macrophylla, Ipomoea indica, Lantana camara, Pittosporum undulatum, Polygonum capitatum, Pteridium aquilinum, Rubus ulmifolius, Ulex europaeus). All terrestrial ecosystems are protected except inland surface waters and non-vegetated islands or sparsely vegetated habitats.

There is no data on the economic impacts of this policy while concerning barriers it is perceived that one case, in particular, may be sensitive, which is the Hydrangea macrophylla, being traditionally the symbol of these islands. Other species are also commonly used for aesthetic reasons, such as Ipomoea indica, Lantana camara. Ulex europaeus is an aromatic plant commonly used in Portuguese cuisine, and Rubus ulmifolius produces berries which are very much appreciated. These plants may be difficult to control because local people perceive they have a concrete value. Regarding the enablers for the facilitation of the policy's application, technicians could possibly be involved.

Criterion 3:

The project was ongoing from 2003 to 2008, but there is no data on how effective it was. Expected results were:

- Improvement of the conservation status of natural habitats and priority species populations;
- Reduction of the effects of invasive plants;
- Elaboration of a list of invasive or potentially invasive species;
- Awareness-raising on the problem of invasive species and the introduction of new species of flora in the archipelago of the Azores.

Finally, no economic or social effects are recorded. However, there might have been some impacts, given the reasons mentioned in the "barriers" section.

3.7 Zemgale Planning Region

Criterion 1:

Attempting to describe the problems addressed by the policy under evaluation, it is observed that the most important ones are related to the following:

- Restricting and limiting of the distribution of the *Heracleum sosnowskyi Manden*. In this framework, IAS cannot be eradicated in one vegetation period (long procedure), people do not see the benefit if the result is not reached within a short period. Protection and management of specially protected nature territories measures for specially protected species and habitats.
- Promoting public involvement and understanding in nature conservation and conservation. Identification of all involved state institutions and stakeholders and explanation of each part responsibilities and duties regarding the spread and restriction measures of IAS.
- Determination of responsible institutions for surveying, monitoring, database creation and information update of IAS.
- Workshops with local authorities (municipalities) were organized to find solutions to problems related to the development and implementation of measures.

The policy is multifaceted as in every other case evaluated, and as such follows certain of the following aspects. In terms of prevention measures, the policy applies a number of compulsory restrictions imposed upon the intentional introduction of IAS or upon any actions that could introduce them unintentionally. It has also established a surveillance system of IAS. Finally, the policy comprises both management measures for already spread IAS included in the form.

On whether and how the policy measure, under evaluation, can supplementarily specify and optimize the application of EU regulation, ZPR states that any experience in prevention and control of IAS is important for optimizing their management. In addition, the development of

an early detection system to prevent the spread of IAS is of vital importance as well, while similarly important is the raising of institutional and administrative capacity.

Criterion 2:

Describing the policy, it is important to focus on the existing Regulations in Latvia regarding IAS. The Regulations of IAS at the national level has a long existence, however it is essentially a plant species law - **Plant Protection Law (entered into force on 13 January 1999)** and the issued Regulations by the Cabinet of Ministers:

- **Cabinet Regulation No 467 Adopted 30 June 2008 „Regulations Regarding Restriction of the Distribution of Invasive Alien Plant Species"**
- **Cabinet Regulation No 468 Adopted 30 June 2008 „List of Invasive Alien Plant Species"**
- **Cabinet Regulation No 559 Adopted 14 July 2008 "Regulation Regarding Restricting the Spread of the Invasive Alien Plant Species – *Heracleum sosnowskyi Manden*".** Heracl*eum sosnowskyi Manden* is the only species for which the restriction of the distribution is defined as an obligation and containment measures for limiting the spread are described in Cabinet Regulation No 559.

Only one species has been controlled through the policy, while Cabinet Regulation No 468 has adopted on 30 June 2008 the „List of Invasive Alien Plant Species" - *Heracleum sosnowskyi Manden*. The Policy addresses the spread of IAS in terrestrial ecosystems and therefore protects the following categories of habitats and ecosystems:

- Grasslands and land dominated by forbs, mosses or lichens
- Woodland, forest and other wooded land
- Regularly or recently cultivated agricultural, horticultural and domestic habitats

Regarding the impact on the economy, activities and measures require financial resources input for Restriction of the Distribution of Invasive Alien Plant Species on the territory of Latvia. Limiting and restricting of invasive species on the one hand has a positive effect on the

economy - the area of land used for different economic activity increases. On the other hand, financial resources are needed for the implementation of the regulation and all the measures and activities, therefore the latter might constitute a potential negative impact.

Furthermore, the main barriers for the policy's successful implementation derive from the outdated or inadequate Latvian legislation on these matters. Nonetheless the latter will clearly define the competences and functions of the institutions with regard to Regulation (EU) No 1443/2014 of the European Parliament and of the Council (22 December 2014).

The Regulation encompasses a set of measures, and several institutions in the country are responsible for its implementation. However, there is no legally clear delegation of tasks, responsible for the complex implementation of the Regulation and its measures.

Absence of clear and agreed priorities for action is another barrier -for example, if the number of IAS is more than 1 (one) according to scientists, then this firstly should be reflected in the legislation documents and only then the further actions could be planned. The second most significant barrier is the lack of financial resources for implementation of the Regulation in Latvia.

The third barrier is low public awareness and/or opposition to government intervention/policy - society does not carry or eager to see the essence of the problem. One more barrier is the inadequate monitoring capacity (inadequate capacity of surveillance/control/monitoring system): not always the controlling authorities have sufficient capacity to enforce the regulatory framework.

Finally, according to the partners' input, there are no enablers facilitating the application of the policy.

Criterion 3:

Due to the lack of financial resources for the implementation of the policy measures, the distribution and spread of IAS continues. The decrease in the population and diffusion of IAS nevertheless derived from the following reasons:

• No legally clear delegation of tasks for implementation;

• No financial resources.

Furthermore, due to the lack of funding, the hogweed monitoring is not carried out, therefore the tendency of the hogweed spread cannot be elaborately evaluated.

The policy is estimated to have a slightly negative impact on the economy of the territory despite all efforts taken. On the contrary, the social impact was slightly positive. In the case of public access to the nature areas, there is still a lot of invaded area/territory in Latvia, in which access to public is restricted. In addition, there have been informative and awareness-raising campaigns on the hogweed, organized for local public in Latvia. Finally, unspoiled and not invaded territory are available for different activities (for example, different kind production etc.).

4. RESULTS - PRESENTATION OF IAS POLICIES IN EU-28.

This section provides a description of different EU Member States for the identification, prevention and management of IAS in Europe. The latter has been prepared from the Portuguese Project Partner, ICETA and is currently merged in this deliverable in order to provide more accurate and representative results, covering all Europe. Ten (10) non in partnership EU countries are presented on the basis of their progress and implementation or not of the IAS Regulation (1143/2014).

4.1 Belgium

The **2020 Biodiversity Strategy** of Belgium includes explicit references to IAS and addresses specific measures for containing the emerging threat of non-native species. The Strategy has the general strategic objective of *'Halting biodiversity loss – restoring and valuing ecosystem services'*. New operational objectives for biodiversity protection and restoration integrate actions foreseen for the identification of alien species pathways. The following provisions are relevant to IAS policy:

- *Objective 3*. 'Maintain or restore biodiversity and ecosystem services in Belgium to a favourable conservation status. Objective 3.7 calls for 'identification and prioritization' to control or eradicate priority species as well as for management for prevention of introduction.
- *Objective 5*. 'Improve the integration of biodiversity concerns into all relevant sectoral policies. *Sub-objective 5.7* addresses the means of impact assessment in regulating import and export decisions, regarding the invasiveness of species.

IAS policy is partly subject to the requirement of Objective 2 regarding the monitoring of threatening processes that foresees the involvement of a number of stakeholders in its implementation: federal and regional authorities, nature conservation agencies, the Belgian biodiversity Research Platform, universities, market actors (including business and import sectors, consumers and other members of civil society), and any association working towards

the same goal as the NBS. Furthermore, IAS monitoring is carried out through the CBD indicators for monitoring threatening processes (e.g. trends in IAS). By adherence to the CBD, parties are encouraged to contribute with data input and promote the public availability of data.

The Strategy includes extensive description of environmental management practices that correlate with vulnerability to IAS. It is shown how the attainment of objectives on climate change, bear a positive effect on mitigation of IAS effects. This approach is productive in that it deals with IAS in an integrated manner, addressing equivalent threats to ecosystems, including: habitat destruction and degradation, pollution, overexploitation, the spread of IAS, the spread of some GMOs and climate change.

Simultaneously, implementation problems include the increased levels of fragmentation of competences on different IAS aspects (environment, health, agriculture). The operational recommendations are formulated as follows:

- Designate or create a single lead structure to co-ordinate and ensure consistency of application of non-native species policies in relevant fields (phytosanitary controls, animal health and welfare, trade in non-native species, biosecurity initiatives, etc.).
- Conduct comprehensive and widely accepted risk assessment procedures for intentional introduction of non-native species in the wild.
- Develop action plans addressing the main introduction pathways to help prevent intentional and unintentional introductions for all relevant sectors.
- Revise, enlarge and update the existing legislation to improve handling of invasive non-native species issues.
- Establish early detection and control mechanisms of detrimental non-native species in the wild.
- Build up and maintain scientific capacity.
- Raise awareness of all relevant sectors to ensure a good understanding of invasive species issues including introduction pathways, economic and ecological impacts.

The strategy devotes provisions on sectoral policies and recommended practices in line with the Code of Conduct for a number of sectors respectively, and objective 5 specifically is devoted to the designation of how to achieve sectoral integration of biodiversity concerns. A list of the instruments guiding the elaboration of the national framework for IAS management includes key international organization involved in dealing with IAS and from whose activities Member States can benefit. They include:

- The World Trade Organization (trade and trade liberalization impact).
- The International Plant Protection Convention (IPPC. Preventative actions regarding pests, plants and plant products.
- FAO (Codes of practices / sector specific on introductions of aquatic species).
- The IMO International Convention for the Control and Management of Ships' Ballast Water and Sediments.
- The CITES convention supported by the EC regulation for its implementation (Controlling imports).
- The ICES Code of Practice on the Introductions and Transfers of Marine Organisms (on intentional introduction).

Regional Measures:

- Walloon Region introduces clauses for the use of pesticides for the management of IAS, while forbidding their use, according to the Forestry Code. Regional management of IAS is under the jurisdiction of a 'dedicated interdepartmental unit' formed upon guidelines within the Strategic Plan

- Flemish Region. The Agency for Nature and Forests has developed an instrument for raising awareness and effecting prevention and operates an early warning system in collaboration with one research institute (INBO) and one NGO (Natuurpunt).

Further resources:

- Green Infrastructure in Belgium
  https://biodiversity.europa.eu/countries/gi/belgium

- Invasive species in Belgium / Belgian Forum on Invasive Species
  https://ias.biodiversity.be/outputs/201403_aliens_on_the_horizon

4.2 United Kingdom

By adherence to the Convention on Biodiversity, the UK policy on IAS has been developing by addressing in an increasingly integrated manner the necessity of managing IAS for biodiversity protection and loss prevention. Simultaneously, the implementation of key EU legislation on biodiversity protection (WFD, Birds & Habitats Directive) enables and supports actions for IAS management, prior to the adoption by the UK at national level in 2008 of '**The Great Britain Invasive Non-native Species Strategy'**.

The Strategy is the main vehicle for the implementation of actions related to IAS management and was updated in 2015 to facilitate the integration of the framework put forth by the Strategy with the relevant EU legislation. Prior to updating the Strategy, the framework effected on the following areas:

- The establishment of the Non-native Species Information Portal (NNSIP), providing a central repository for non-native species information and distribution data;
- Undertaking and publishing risk assessments for 60 species, with a further 71 under way;
- Responding effectively to threats, including efforts to eradicate the ruddy duck, which has seen the population decline from 6,000 in 2000 to around 30 today;
- Raising awareness through two campaigns focused on aquatic plants ('Be Plant Wise') and recreational water users ('Check Clean Dry');
- Undertaking an assessment of the economic impact of invasive non-native species, which indicated an annual cost to the British economy of £1.7 billion.

Given the flexibility in implementation means that member states mobilize, the UK has instituted the GB non-native species mechanism. The latter is managed by the Programme Board, composed of the Department for Environment, Food & Rural Affairs and the Non-Native Species Secretariat. The mechanism consists in the following elements: i) the Media and Comms Working group, ii) Country Working Groups, iii) Rapid Response Working Group, iv) the Non-native Species Information Portal (NNSIP), v) Non-Native Risk Analysis

Management (NNRAP) and, vi) Stakeholder Forum. These components of the mechanism cover the majority of requirements to be satisfied by MS in implementing the IAS EU regulation.

Non-Native Species Secretariat (NNSS):

The NNSS and the corresponding portal is instrumental in organizing and delivering early detection, surveillance and monitoring of IAS. According the Secretariat's self-presentation, its role is determined as 'providing a central repository for non-native species information and distribution data, increasing the flow of distribution data into central databases, providing a horizon scanning function and maintaining an alert system'. The website hosts 'information on all non-native species recorded in GB'.

Further Resources:

- The Fifth National Report to the CBD:
  https://www.cbd.int/doc/world/gb/gb-nr-05-en.pdf
- The Great Britain Invasive Non-native Species Strategy:
  https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/455526/gb-non-native-species-strategy-pb14324.pdf
- GB non-native species secretariat (NNSS) website:
  http://www.nonnativespecies.org/home/

4.3 Bulgaria

The management of IAS in Bulgaria is subject to the framework defined by the *1143/2014* EU Regulation. As foreseen, Bulgaria is taking steps towards its implementation, notably, by proceeding to assessments and action plans in line with the objectives of preventing, managing and eradicating IAS to mitigate the adverse effects (environmental and economic) of IAS.

More specifically, the **National Biodiversity Strategy of Bulgaria** was enacted to achieve the abovementioned aims. The Ministry of Environment and Water (MOEW) is the responsible body for the implementation of the IAS Regulation through the National Biodiversity Strategy. A number of scientific, environmental and development stakeholders are implicated in the development of policy for IAS in Bulgaria.

The National Biodiversity Strategy of Bulgaria articulates the relevant *'[s]trategic Goal A. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society'*. This policy priority is reflected in all important policy instruments of the country (e.g. National Regional Development Strategy (2012–2020), National Rural Development Program (2014–2020), National Action Plan for the Conservation of Wetlands in Bulgaria (2013–2022), National Forestry Strategy (2013–2020), National Program for Fishery and Aquaculture (2007–2013) and the related Action Plan, National Strategy for Sustainable Development of Tourism (2009–2013)) as well as in the relevant OP "Environment". Achieving this aim is foreseen to take place through an increase in public concern and involvement, as well as through an increase in the capacity for the implementation of biodiversity related actions.

'Strategic Goal B. reduces the direct pressures on biodiversity and promote sustainable use'. This goal is set to be achieved through actions for the reduction of loss and fragmentation of natural habitats. '*Strategic Goal C. Improvement of the status of biodiversity by safeguarding ecosystems, species and genetic diversity*'. *'Strategic Goal E. Enhance implementation through participatory planning, knowledge, management and capacity building'* foresees actions for the involvement of ordinary citizens (e.g. citizen science) in research for biodiversity protection.

The Strategic goals cited above provide the policy framework by which the management of IAS is carried out in Bulgaria. Strategic goal B. is explicitly addressing the objective of reducing the impact of invasive species, through relevant activities of mapping, impact and risk assessments. The policy requires specifications for aspects of IAS management, or, alternatively, a National Strategy and Action Plan on IAS have to be developed and implemented in order to follow through the Regulation requirements. National authorities have, since the enactment of the Biodiversity Strategy, proceeded to a series of actions necessary for the implementation of the IAS Regulation, including species' assessment.

East and South European Network for Invasive Alien Species (ESENIAS)

Within the contours of the Strategy, ESENIAS was founded as a regional data portal for the exchange of information on IAS and early warning. The stated aim of the portal is the facilitation of the exchange of information on IAS management components. The Bulgarian Academy of Sciences, the Ministry of Environment and Water and the International Association for Danube Research (IAD) are actors who regularly contribute to the workings of the network. Most recently, a monitoring project has been accomplished in the Bulgarian side of the Danube through the cooperation of the above-mentioned actors (Potential Threats to Sustainable Development in the Danube and Black Sea Region: the Danube – A Corridor of Invasive Alien Species (2012 – 2017).

Further Resources:

- A full list of relevant policy instruments in Bulgaria can be found in Trichkova et al. (2016).
- The full text of the National Biodiversity Strategy: *https://www.cbd.int/doc/world/bg/bg-nr-05-en.pdf*
- The ESENIAS website:
- *www.esenias.org/*
- Convention on Biological Diversity Fifth National Report, 2009-2013 *https://www.cbd.int/doc/world/bg/bg-nr-05-en.pdf*

4.4 Slovenia

The Republic of Slovenia in *its Fifth National Report on the Implementation of the Convention on Biological Diversity* takes account of invasive alien species, recognizing that the spread of IAS is more pronounced in the present, thus requiring concrete actions for biodiversity safeguarding and for the management of associated roll-on risks for society and the economy.

These actions are specified in the **Strategy for the Management of Non-native Invasive Species**: (Operational Programme – *The Strategy for the Management of Non-native Invasive Species*. *Objective*: to preserve the natural composition of ecological community, as far as possible. The Operational Programme (in terms of content, it also delineates a strategy) includes detailed measures and a roadmap to their implementation for achieving the objective. The OP has not been adopted yet.

Objectives within the Biodiversity Conservation Strategy (BCSS) 2002-2012:

- Detailed national target 3: By 2020 the invasive alien species and their pathways will be identified. By 2025, the invasive alien species and their pathways will be brought under control (Corresponding Aichi targets: 9. 19).

<u>Measures for inter-sectoral cooperation regarding invasive non-native species:</u>

- Coordinate work related to non-native invasive species among sectors, as well as nongovernmental organisations, local communities, experts and private companies, institutes and other stakeholders;
- Educate and raise the awareness of the general public as regards the issue of non-native invasive species (what they are, why they pose a problem, what every person can do, etc.);
- Include the public in the prevention of the introduction and spreading of non-native invasive species (acquire support in and for the implementation of measures) and the gathering of data on these species;
- Set up a system for monitoring warnings and providing information, which will be supported by the system for monitoring (with an emphasis on key introduction points)

and inspection;

- Set up a rapid response system when the introduction of a non-native invasive species is detected or a warning regarding such a species is received (determining activities for prevention, disposal, control or keeping);
- Supplement the deliberate introduction system in cooperation with other sectors (health, the veterinary sector, customs, agriculture);
- Promote and participate in the strengthening of capacities, and the performance and effectiveness of institutions and individuals involved in biodiversity conservation.

Horizontal & cross-sectoral targets on education and awareness-raising:

Measures for inter-sectoral cooperation regarding education and public awareness-raising:

- Encourage the participation of volunteers in the performance of tasks related to biodiversity conservation (citizen science);
- To ensure that educational content on the importance of biodiversity is included in all formal education programmes and that the quality of execution of such programmes is improved;
- Ensure uniform technical training on biodiversity within the continuous training of employees;
- prepare materials on biodiversity that will be included in natural science subjects at all education levels in an appropriate manner;
- Ensure that ecology and environmental and nature protection are mandatory components of subjects involving natural science and biology and subjects involving technologies related to activities affecting the natural environment;
- Ensure that emphasis is placed on learning about local biodiversity, its functions and interconnections at the local and global levels;
- Ensure, through the clearing-house mechanism, that the public is promptly informed of new developments in biodiversity and of possibilities for participating in various campaigns and decision-making procedures related to biodiversity conservation;
- Ensure the promotion of biodiversity on the websites of public services and the

presentation of links between biodiversity conservation and access to quality ecosystem services;

- Compose a list of professions and services (e.g. concessionaries in watercourse management) related to biodiversity and prepare materials related to their area of work to be included in their training and awareness-raising;
- Ensure the quality presentation of subject content on the importance of biodiversity in formal educational programmes for certain occupations;
- Ensure and implement the continuous inclusion of biodiversity content in the operation of certain occupations and services;
- Monitor the activities of services within the public sector that are related to the education and awareness-raising of various publics and, if necessary, to enhance their cooperation.

Measures for inter-sectoral cooperation regarding invasive non-native species:

- To coordinate work related to non-native invasive species among sectors, as well as nongovernmental organisations, local communities, experts and private companies, institutes and other stakeholders;
- To educate and raise the awareness of the general public as regards the issue of non-native invasive species (what they are, why they pose a problem, what every person can do, etc.);
- To include the public in the prevention of the introduction and spreading of non-native invasive species (acquire support in and for the implementation of measures) and the gathering of data on these species;
- To set up a system for monitoring warnings and providing information, which will be supported by the system for monitoring (with an emphasis on key introduction points) and inspection;
- To set up a rapid response system when the introduction of a non-native invasive species is detected or a warning regarding such a species is received (determining activities for prevention, disposal, control or keeping);
- To supplement the deliberate introduction system in cooperation with other sectors (health, the veterinary sector, customs, agriculture);

Further Resources:

- Slovenian Environment Agency – Biodiversity portal: *http://www.arso.gov.si/en/soer/biodiversity.html*
- Ministry of Agriculture, Forestry and food. Monitoring of species diversity and abundance of non-native species in the Slovenian Sea *http://www.ribiski-sklad.si/en/List_of_operations/Monitoring_of_species_diversity_and_abundance_of_non-native_species_in_the_Slovenian_sea/*
- Use of eDNA for early detection of non-native species or for monitoring of eradication measures *https://circabc.europa.eu/sd/a/ae340f1e-ff9c-4b0a-8113-ddae08e92020/IASEG-use-eDNA.pptx.pdf*

4.5 Austria

The Biodiversity Strategy Austria 2020+ is based on mutually reinforcing and legally binding frameworks, namely, the *Convention of Biological Diversity*, the *Habitats Directive* and the *Birds Directive* and the *Water Framework Directive* and as of recently, the Invasive Alien Species Regulation. *Target 8* of the Strategy concerns the mitigation of adverse effects of invasive alien species. The target is set to be achieved by crossing the milestones set, that is, the implementation and update of the EU *IAS Regulation* by 2019 and raising public awareness by the same year.

Through prior assessments of natural habitats as a result of adherence to environmental conventions and implementation of Union legislation (e.g. Habitats Directive), invasive alien species were identified as a major source of risk for biodiversity. The relevant measures foresee the following in detail:

- The review of national legislation in view of contradictions between the EU Regulation and national law
- Information and experience exchange on successes and failures in control measures
- Adaptation of existing monitoring systems (plant health, protection, health, forest inventories, water management and nature conservation)
- Review of policy options and introduction of **citizen science** for recording in cooperation with experts
- Updating national inventory
- Continuation of the "**Focal Point Neobiota"**
- Intensification of invasion-ecological research
- Encouragement of prevention efforts (awareness raising across relevant sectors)
- Initiatives in education system

Further, the target achievement rate is set to be evaluated with the following criteria: i) status and trends of invasive alien species ii) control costs for invasive alien species, iii) problem awareness among selected target groups.

Of relevance are the specific targets set for the conservation and improvement of species and habitats:

- 36% of habitats and 17% of species of the Habitat Directive is improved compared to 2007 (2020)
- Improvement of threat status (2020+)
- 15% of degraded ecosystems improved or restored

  Regarding actions relating to ecosystem restoration and green infrastructure, among which the containment, management and eradication of IAS is are included, these are to be 'executed at local or federal province level, funded by different sources including EU support. Austria is currently implementing a program and time horizon for new risk assessments, to be raised from 10-15 per year to 50.

The Biodiversity Strategy Austria **Further reading and resources:**

- **Biodiversity Strategy Austria 2020+:**
  https://www.cbd.int/doc/world/at/at-nbsap-v3-en.pdf
- Umweltbundesamt Environment Agency Austria
  http://www.umweltbundesamt.at/en/

4.6 Finland

The institutions responsible for enacting the **National strategy for invasive alien species (2012)** are the Ministry of Agriculture and Forestry, the Ministry of the Environment, and the Ministry of Transport and Communications. In addition, the Ministry of Agriculture and Forestry has founded the Finnish Advisory Board for Invasive Alien Species. The boards operates in its capacity as an expert body on the issue, while it contributes to coordination and implementation of the National Strategy. In a nutshell, the Strategy delineates the implementation of 16 sets of measures for invasive alien species, and international commitments and other obligations concerning invasive alien species (e.g. IMO, HELCOM, and the EU). The two main aims are the following:

- Increasing research on invasive alien species, on the basis of the national strategy for invasive alien species, particularly by initiating research on the impacts of invasive alien species and the effectiveness and cost-efficiency of the related prevention, so as to enable the correct targeting of measures taken to prevent the detrimental effects of such species.
- Examining the key routes through which invasive alien species enter the country, and measures required for controlling them.

Schedule for 2013–2020:

Status in 2018: The National Strategy for Invasive Alien Species is currently being deployed. Some of the actions have already been completed, and some have become established actions. The most important actions supporting the prevention of detrimental effects caused by invasive alien species have included:

- a negotiating committee on invasive alien species has been instated (2013)
- the Finnish Invasive Alien Species Portal has been launched (2014)
- the EU *Regulation on Invasive Alien Species* (2015), the *Act of Managing the Risk Caused by Alien Species* (2016), the *Government Decree on Invasive Alien Species of National Concern* (2016), and the EU *List of Invasive Alien Species of Union Concern* (2016) have

come into force

- a monitoring system for invasive alien species has been created, national prevention prioritizations have been proposed, the EU List of Invasive Alien Species of Union Concern has been supplemented, and the Arctic Invasive Alien Species Strategy and Action Plan has been accepted (2017). (From the National Strategy for Invasive Alien Species).

Further, Finland ratified the International Convention for the Control and Management of Ships' Ballast Water and Sediments of the International Maritime Organization (IMO) in 2016.

Thanks to the EU *Regulation on Invasive Alien Species* and the national *Act of Managing the Risk Caused by Alien Species*, a significant part of the actions in the national strategy, the responsibilities of EU member states, and international responsibilities can be implemented. By virtue of the EU *List of Invasive Alien Species of Union Concern* and the *Government Decree on Invasive Alien Species of National Concern*, prevention will be directed at the most detrimental species. (Biodiversity Action Plan)

Numerous research projects have investigated the consequences of invasive alien species, the effectiveness of prevention, cost efficiency of actions, and the dispersal routes and their management. These projects can be found in the Finnish Invasive Alien Species Portal (see further information).

Further information:

- The Finnish Invasive Alien Species Portal
  http://www.vieraslajit.fi/fi/content/welcome-invasive-alien-species-portal
- Finland's biodiversity action plan
  https://www.biodiversity.fi/actionplan/action-by-category/cross-cutting-issues/climate-change-and-invasive-alien-species/national-strategy-for-invasive-alien-species

4.7 Malta

The **National Strategy for Preventing and Mitigating the Impact of Invasive Alien Species (IAS)** in the Maltese Islands takes measures to streamline and enhance proactive action for the management of bio invasions, and safeguarding biodiversity. The strategy is accompanied by National Codes of Best Practice and its roll-out aims to address in a structured and sustained way the priorities of Malta's National Biodiversity Strategy and Action Plan (NBSAP, 2012-2020; BI1 – BI3.)

The national context:

The Strategy includes a detailed description of the legal framework underlying the management of IAS:

Multilateral environmental agreements (MEAs), notably the UN *Convention on Biological Diversity* (CBD), are detailed and it is clarified thereby that the conventions to which Malta is a signatory become effective at the national level while coordination is facilitated by the Inter-Agency Liaison Group on Invasive Alien Species (IALG-IAS).

Further international agreements include the *Convention on the Conservation of Migratory Species of Wild Animals* (CMS), the *Ramsar Convention on Wetlands*, the *Convention on the Conservation of European wildlife and natural habitats* (Bern Convention), the *Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean* and the *Protocol concerning specially protected areas and biological diversity in the Mediterranean* (SPA & Biodiversity Protocol).

In the context of the operations of the *Regional Activity Centre for Special Protected Areas* (RAAC/SPA), itself subject to the Barcelona Convention implementation and the Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean (SAP BIO). In this context the "Action Plan on Introductions of Species and Invasive Species" was adopted in 2003. Other International instruments with binding actions entailed at the national level include CITES (Convention on international Trade in Endangered Species of Wild Fauna and Flora, UNCLOS, IMO, MEPC, IPPC, EPPO, ISPMs).

Chapter 3.0 within the National Strategy on Invasive Alien Species, sets out the '*National Strategic goals and Measures to combat IAS*'. The foreseen stakeholders implicated in the implementation of the various IAS-related obligations are the following: Wild Birds Regulations Unity, Department of Fisheries and Aquaculture, Ports and Yachting Directorate, Merchant Shipping Directorate, Customs, Ambjent Malta, Plant Health Directorate, Veterinary Regulation Directorate, Animal Welfare Directorate, Trade Services Department and Transport Malta. The roles of the respective authorities and the corresponding actions to be taken up are designated in detail. The National framework's guiding principles are then presented (following the structure of the CBD guiding principles: (e.g. precautionary Approach, Ecosystem approach).

Further, the strategy takes account of available resources for interactive reporting and web-based information systems on Alien and Invasive Species and proceeds to provide details regarding the implementation of risk analysis (assessments + risk management), quick/rapid screenings, along with lists of factors underpinning screening outputs. Surveillance (Active and passive) surveys (generic, site-specific, species-specific). Controls, penalties for infringements, remedial management, post-eradication monitoring.

<u>Communication, Education and Public Awareness (CEPA) sections:</u>

- *The circulation of information via electronic taxonomic and species databases (clearing-house mechanism, apps etc.) – this allows rapid identification of alien species therefore facilitating early detection of novel alien species and consequently assist in rapid reporting and action;*
- *Launching workshops and seminars to discuss proposals on actions and programmes;*
- *Media promotion (including social networks) as an efficient means of promoting wider public awareness;*
- *Public display boards and active displays e.g. within protected areas, botanic gardens and zoological gardens;*
- *Interaction with the various stakeholders - most of the stakeholders namely the concerned public, farmers, gardeners, landscape managers, fishermen and ecologists as well as environmental groups, and divers could notice new alien species in the course of their*

activities. Therefore they warrant involvement in awareness raising activities;

- *The buildup of educational programmes on IAS and environmental issues such as species and habitat conservation in the Maltese Islands targeting different audiences;*
- *Awareness material such as posters illustrating unwanted non-native species – such posters should be affixed at high-risk entry points in full view for the public to see and should illustrate photo identifications giving the name of the species, a description of its size and appearance, the damage it causes and what the person who sees it should do and to whom he/she should report the observation.*

The regional context:

- Rural development and biodiversity: Malta's RDP (2014 – 2020) marginally makes provisions for IAS management, mostly as far as actions to support the removal of invasive species and their substitution with endemic and indigenous tree species. Related to this, there are sectoral instruments accounting for biodiversity management, notably, at the level of considering agricultural genetic diversity and, to this end, foresees 'supporting the control of invasive alien species

Citizen Science & 'participatory conservation':

Of particular interest in the Maltese IAS Strategy are the sections on 'citizen science' providing the contours for the engagement of citizens both in the way of informal science education and research at broad scales with the aim of addressing knowledge gaps and increasing the flow of data on IAS.

The Strategy concludes with a comprehensive list of recommendations derived synthetically from all the policy instruments to which the management of IAS is subject. These concern the following:

Competent authorities	Penalties
National IAS Legal Regime	Remedial/Management measures
Precautionary Approach	Eradication

Ecosystem Approach	Containment
Prevention	Control
Intentional Introduction	Impact mitigation
Unintentional Introduction	Restoration
Contained Holding	Scientific Research
Prioritizing via Species Listing	Best Practice
Risk Assessment	Communication, education & Public Awareness
Early Detection & Surveillance	Citizen Science
Risk-based Office Controls	Cooperation & Coordination

"Spot the Jellyfish" initiative. This initiative is addressed to young children, their parents and their teachers in recording the sightings of species of jellyfish in the coastal waters around the Maltese Islands during the summer period. Apart from increasing the awareness of children, the data obtained via this initiative also supports monitoring undertaken by local marine experts and the tourism authority. Amongst the jellyfish on the online reporting form are not only those species that are common to the Mediterranean, or that pose a health concern (e.g. the mauve stinger, *Pelagia noctiluca* and the Portuguese man o' war, *Physalia physalis*), but also included are those that are identified as invasive in the Mediterranean Sea – e.g. *Rhopilema nomadica* (nomadic jellyfish). More information on native and invasive jellyfish species in the Mediterranean is provided by Brotz and Pauly (2012).

This initiative was followed-up by the **'Spot the Alien Fish' campaign,** launched by the University of Malta in 2016 and dealt with non-indigenous fish species. Through the campaign a poster was launched featuring 32 fish species known to have entered the Mediterranean through the Suez Canal or through the Straits of Gibraltar and which had either been recently recorded in Maltese waters or had been recorded in the contiguous regions, such as Sicily and Tunisia.

In 2017, the Ministry for the Environment, Sustainable Development and Climate Change (MESDC) launched a mobile app on Maltese Flora and Fauna, including IAS of EU concern. The purpose of the app was to enable species reporting, allowing citizens to contribute to early

detections of new invasive pests and species. Users can use factsheets and pictures for identification of species that have been observed. Once validated by experts, the data will be manually input into back-end information system. Currently the project can serve as potential Citizens Science tool to collect data and build community around citizens, NGO's, University of Malta, schools and experts to validate records and data. In the future this mobile app will be released with additional content for all terrestrial *Natura 2000* sites for Malta. (From the National Strategy for Preventing and Mitigating the Impact of Invasive Alien Species in the Maltese Islands).

Malta Environment and Planning Authority (MEPA) has contributed to EU projects **('MedPAN North project'**) for data collection for selected marine alien species in Maltese Protected Areas (MPAs). Data collection was achieved with the participation of various non-expert individuals and groups (divers) and the involvement of specialist organisations (Department of Biology, University of Malta)

Further reading and resources:

- National Strategy for Preventing and Mitigating the Impact of Alien Species (IAS) in the Maltese Islands: *https://era.org.mt/en/Documents/IAS-Strategy-Final_Public_Consultation.pdf*
- MEPA guidelines: http://www.mepa.org.mt/guidelines-alienplants

4.8 Poland

The basic document driving biodiversity protection in Poland is **The Programme of conservation and sustainable use of biodiversity along with Action Plan for the period 2015-2020**. Within the Programme objectives, specific objective F: *'Limitation of hazards resulting from climate changes and pressure of invasive species'*, sets the direction for the corresponding implementation which are: *'F. I. Monitoring of the impact of climate changes'*; *'F.II. Limitation of pressures of invasive species'*. *Objective F.I* and *F.II* are foreseen to be met by law amendments regarding the prevention of the appearance and spread of external invasive species by 2018. As indicated in the Programme, the 'realisation of the measure will be approved as preparation of the draft amendment of the Act on Environmental Protection' (pp.:22). F.I consists in one task (i.e. 65. Preparation and implementation of assumptions concerning climate change assessment system consistent with National Environmental Monitoring') the responsibility for which lies with the Ministry of Environment. The rationale is cited below:

'In order to deepen knowledge with regard to climate change effects on ecosystems and species it is planned to prepare assumptions and methodology which make it possible to state and assess the impact of climate changes on biodiversity. It is important to create climate change effects assessment system on the basis of results of National Environmental Monitoring.'

F.II Limitation of the pressure of alien invasive alien species. The attainment of this objective depends on the successful enactment of the following measures:

- Adjustment of Polish legislation and preparation/ implementation of organisational - financial solutions. The responsibility for these measures lies with the Ministry of the Environment and the National Administration for Water Management.
- Implementation of the Prevention Programme against alien species. The General Directorate for Environmental protection is the agency responsible for implementation.
- Establishment of supervision and monitoring system covering alien invasive species. The Ministry of the Environment is responsible for launching alien invasive species monitoring.

In terms of designated instruments for the implementation of the programme, specifically in terms of managing IAS, securing financial support for relevant actions takes place through the Infrastructure and Environment Operational Programme 2014-2020, providing, among others, for 'implementation of strategic goals with regard to the restoration of habitats dependent on waters, invasive species, protection planning, ecological corridors.

Resources & further reading:

- The General Directorate for Environmental Protection
  http://www.gdos.gov.pl/eng
- The National Strategy for the Conservation and Sustainable Use of Biodiversity
  https://www.cbd.int/doc/world/pl/pl-nbsap-v2-en.pdf
- Resolution No. 213 of the Council of Ministers of 6 November 2015 on the approval of "The programme of conservation and sustainable use of biodiversity along with Action Plan for the period 2015-2020.".
  https://www.cbd.int/doc/world/pl/pl-nbsap-v3-en.pdf
- IOP PAN database of Invasive Alien Species in Poland
  http://www.iop.krakow.pl/ias/en

4.9 Denmark

Denmark's *'Action plan against invasive species'*, issued by the Ministry of Environment and Food of Denmark – Environmental Protection Agency, was issued in 2017 providing detailed information on the national strategy for invasive species. Similar to other strategic documents, the strategy encompasses an analytical description of the different conventions and instruments to which Denmark is a signatory party and which entail measures enacted at the national, regional and local levels, as well as at the level of cooperation among national authorities, with experts, at EU-level and cross-border. The Action plan against invasive species is enacted in complementarity to other legally binding instruments by virtue of adherence to various relevant international conventions, notably, the IMO's Ballast Water Convention in 2012

The Danish Minister for the Environment and Food has the mandate to take up a series of actions imposing bans and granting exceptions regarding IAS. For this to happen, the *Nature Protection Act* should be subjected to revision on the basis of consultations with the national list of IAS that will serve as a 'legislative tool which should make efforts to control invasive species more efficient and more cost-effective.'

The Danish EPA is committed to implementing a plan for prioritizing pathways to be addressed (see Madsen 2014). The basic pathways identified are 'horticulture', 'forestry', 'landscape management', 'ballast water and sediment' and 'aquaculture'. An action plan is scheduled to be drawn up in 2019 in consultation with all the relevant stakeholders for the management of these pathways. The Action plan includes a full, subject to review, list of IAS in Denmark.

The latest Danish Red List goes back to 2010 and an update is expected in 2019. In the last report from 2010 more than 8.000 species had been evaluated. Approximately 65 % of these species were of least concern, approximately 19 % were near threatened, vulnerable or endangered and around 9 % were critically endangered or regional extinct. (Updated biodiversity country profile)

The Danish policy on IAS is partly enacted on account of Natura 2000 management plans whose purpose is to 'halt the decline in biological diversity and to maintain and restore the

conservation for species and habitats'. (http://naturstyrelsen.dk/naturbeskyttelse/natura-2000/natura-2000-planer/natura-2000-planer-2009-15/)

National Monitoring Programme for the Aquatic Environment and Nature (NOVANA):

Monitoring of species and habitat types in Denmark is primarily carried out via NOVANA, which is tasked with supporting prioritized national requirements for monitoring-data on the impact, condition and development of habitats and the environment in Denmark. NOVANA comprises eight sub-programmes for the sea and inlets, lakes, watercourses, substance transport and land monitoring, point sources, groundwater, terrestrial species and habitat types, as well as the air. Monitoring of the individual programmes is precisely specified as it pertains to applicable obligations regarding EU Directives. Checks are carried out at a large number of stations across Denmark within the various sub-programmes. The data collected in connection with site visits is logged in various databases and is quality-assured. A significant amount of monitoring data is published in 'Danmarks Areal information', accessible via the Danish Natural Environment Portal.

Analysis and monitoring of habitat types already includes registration of a wide range of invasive plant species, and this is used to evaluate the condition of habitat types as the basis for the planning of Natura 2000 and active measures in these areas, as well as in reporting to the EU in accordance with the Habitats Directive (Taken from the 'Action Plan against invasive species').

Actions 7 & 8:

- Inclusion of invasive species in NOVANA
- Marine monitoring

  In 2017, NOVANA will be supplemented by marine sample-taking, whereby a range of invasive species will be investigated with the help of free DNA in the environment (eDNA). Methods are being developed to detect around 20 marine invasive species, including the relevant species from the Union list. In addition, experiments are being carried out on monitoring areas at high risk for introductions, such as certain ports.

Other sectoral actions foreseen include:

- Registration of invasive species during fisheries inspection: The Danish EPA and the Agency for Agriculture and Fisheries will establish how the registration of invasive species during fisheries inspection can contribute to the knowledge base on the distribution of invasive species.

In terms of advancing measures to increase communication and awareness, Action 11 *'Registration of invasive species in a new portal'*. The designated specifications are the following:

A reporting portal is established for reporting invasive species, whereby anyone passing through a natural area will be able to register sightings of a number of invasive species, including species on the Union list. This method of registering species is not comparable with systematic monitoring data, but can provide data on the introduction of new species and on the overall distribution of invasive species in Denmark. The reporting portal has been established in such a way that it is quick and simple to report sightings of invasive species via the website from a computer, tablet or smartphone: Each report received by the Danish EPA will be verified and incorporated into the knowledge base on the distribution of invasive species, which, as mentioned, will form the basis of decisions concerning potential management measures.

Further measures include provisions for hunting, essentially addressing the points made by the European Code of Conducts for the sectors. A series of actions 14-29 regard specific biodiversity hazards associated to IAS in the Danish ecosystem, while a further set of actions address the priorities of setting up the parameters for cooperation between stakeholders at various levels.

The 'Our shared Nature' – the *Danish Nature Policy* includes provisions for IAS management. More specifically, 'Initiative 15' commits that 'Efforts to combat invasive species must be intensified'. The Government is thereby committed to:

- Strengthening initiatives against invasive species (including more hunting, registration and bans on trade) as per the new EU regulation on invasive species.

- Focus efforts on the most important means by which invasive species spread into Denmark
- Continue to build on the existing efforts over many years to control invasive species, focusing on individual species. […] In addition, the control of invasive species will be part of the work on the Natura 2000 plans.
- Focus on intensifying initiatives against invasive species in cooperation with neighboring countries and internationally
- Prioritise Danish participation in the NOBANIS Network that ensures knowledge sharing regarding the spread and control of invasive species in Europe.
- Ensure synergy effects within the framework of Denmark's Marine Strategy for minimizing the impact of invasive species. (taken from Danish Nature Policy)

The case of managing invasive birds is an example of how the Danish framework for the management of IAS, is designed to mobilize a broad array of stakeholders. Regarding Avian Introduced Alien Species, a number of mechanisms are deployed (e.g. the Atlas project (Dansk ornitologisk Forensing, Birdlife Denmark), the Common Bird Census and DOFbasen, bring in resources for preventing, managing and eradicating species not endemic and threatening to the Danish ecosystem.

"Den Danske Naturfond" was founded in 2015 by the Danish state and two large private conservation foundations. It is the aim and purpose of the fund to promote the protection of nature and water environment in Denmark by implementing measures for the creation and development of natural biotopes as well as for the promotion of the habitats of the animal and plant world.

Further resource & reading:

- 'Action plan against invasive species': *https://eng.mst.dk/media/191170/04_uk_handlingsplan_invasive-arter_a4.pdf*
- Danish Nature Policy – Our Shared Nature *https://www.cbd.int/doc/world/dk/dk-nbsap-v2-en.pdf*

- Fox, A. et al. (2015). 'Invasive alien birds in Denmark'. *Dansk Orn. Foren. Tidsskr*, 109:1. pp.: 193-205.
- Madsen, C. L. et al. (2014). 'Pathways for non-native species in Denmark'. Department of Geosciences and natural resource management: University of Copenhagen. IGN Report.
- Ministry of Environment and Food of Denmark. (2019) 'Updated biodiversity country profile: Status and trends of biodiversity, including benefits from biodiversity and ecosystem services and functions'.
- Concentrated NOBANIS data on Denmark: *https://www.nobanis.org/globalassets/national-regulations/regulation-relevant-to-alien-species-dk_old.pdf*
- Monitoring of non-indigenous species in Danish marine waters (eDNA methods) *https://naturstyrelsen.dk/media/132530/nst-monis-report-final.pdf*

4.10 Ireland

The National Biodiversity Action Plan, 2017-2021 of Ireland follows up from the second National Biodiversity Plan, 2011-2016. The National Plan is the basic policy driving biodiversity policy promoting safeguarding measures and the valorization of habitats and species, establishing the links between biodiversity protection and decision-making mechanisms and the various agencies and stakeholders in need of coordination to reach the designated targets.

Objective 4 in the National Plan states the commitment to 'Conserve and restore biodiversity and ecosystem services in the wider countryside'. *Target 4.4.*, indicates that '[h]armful invasive alien species are controlled and there is reduced risk of introduction and/or spread of new species. Additionally, however, *Objectives 1, 2, 3, 'mainstreaming biodiversity into decision-making across all sectors'*, *'Strengthen knowledge base for conservation, management and sustainable use of biodiversity'*, and *'increasing awareness and appreciation of biodiversity and ecosystems services'*, respectively address aspects of dealing with invasive species, especially, in enacting awareness measures, or promoting the implementation of the relevant Codes of Conduct to foster prevention of introductions, and citizen-science monitoring.

The National Plan depends on support from legislation designed to address specific aspects of the EU Regulation.

In detail,

- *Target 1.2; Action 1.2.5*. 'Publish legislation to address required provisions under the EU Regulation on invasive alien species (No. 1143/2014) and on responsibilities and powers regarding invasive alien species, giving IFI responsibility for aquatic invasive species. Performance indicator: 1. Legislation published.
- *Target 4.4; Action 4.4.2*. Develop national and whole island plans to implement the EU invasive Alien Species (IAS) Regulation […] including development and adoption of biosecurity plans in relevant state bodies; a Rapid Response Protocol for the island of Ireland; coordination and collation of invasive species surveillance and monitoring data; and work with Northern Ireland and UK authorities on invasive species of mutual

concern. Performance indicator: 1. Number of state bodies with biosecurity plans; 2. Rapid Response protocol for Ireland developed; 3. Number of new IAS recorded and established.

- *Target 4.4; Action 4.4.3*. 'Continue and enhance measures for eradication, where feasible, control and containment of invasive species'. Performance indicator: Number of successfully controlled invasions.
- *Target 4.4; Action 4.4.5*. 'Continue to produce Risk assessments for potentially invasive non-native species.' Performance indicator: Number of risk assessments completed for potentially invasive non-native species..
- *Target 4.4; Action 4.4.6*; 'Publish legislation to address required provisions under the EU regulation […] giving IFI responsibility for aquatic invasive species. Performance indicator: Legislation published and enacted.
- *Target 4.4; 4.4.7* Work with horticultural and pet trades to prevent the introduction and spread of invasive alien species

The special report on IAS establishes in detail a framework for the enactment of biodiversity policy regarding alien, invading species. The report defines 10 Key Actions:

- **Key Action 1**. Detailed risk assessments and contingency plans should be urgently prepared for species that are likely to invade Ireland in advance of their arrival.
- **Key Action 2**. Barriers to a rapid and decisive response to new invasions should be minimized by high level cross-jurisdictional and inter-departmental support for and funding of contingency plans.
- **Key Action 3**. The ecological and economic impact of long-standing alien species and technology for their control should be investigated in detail in order to plan and execute cost-effective strategies for control and eradication.
- **Key Action 4**. Legislative provisions should be analyzed and new legal frameworks developed specifically for dealing with invasive species, while facilitating beneficial introductions.
- **Key Action 5**. A framework, including support for specialist identification skills, should be established for the collation and cross-border exchange of information on non-native species.

- **Key Action 6**. Measures for the prevention and eradication of invasive species should be incorporated into agri-environment schemes.
- **Key Action 7**. The dissemination of information to the public and the engagement of stakeholders, particularly in the commercial sector, should be prioritised by developing online, educational and scientific resources, and by targeted public awareness campaigns.
- **Key Action 8**. The use of native species in amenity planting and stocking and related community actions to reduce the introduction and spread of nonnative species should be encouraged.
- **Key Action 9**. The two jurisdictions should continue to work through international mechanisms to improve the regulatory and policy framework for dealing with invasive non-native species.
- **Key Action 10**. A cross-border specialist group should establish a dedicated agency to lead on invasive species issues, beyond the immediate actions prioritised above.

The report explains in detail policy linkages and the mutually re-enforcing character of the relevant conventions (notably, the Bern and Bonn Conventions, the Convention on Biological Diversity (CBD)). A complete list of domestic legislation relevant to non-native species is provided facilitating the oversight of the subjects and sectors that the management of invasive species is brought to bear relevance. A number of problems are identified through analysis of the current predicament. These problems are summarized below:

- Time delays caused by inflexible codes of practice → need to adopt codes of practice and gain support of the trade sectors which they involve
- Low fines not adequately acting to deter derogations
- Unequal treatment of plants and animals in law
- Lack of power to prevent sales where these involve the internet
- Outdated lists of relevant species
- Lack of duty of care on any particular sector
- No planning for unintentional introductions

- Lack of enforcement powers

Further, a number of sectors are addressed and the problem of escapes from private collections is foregrounded, acknowledging that there are large number of illegal releases of non-native species. The *International Species Information System* (ISIS) is instrumental in this respect. Biological control is not subject to 'specific legislation'. Provisions on fish farming and aquaculture define the *Department of Communications, Marine and Natural Resources* (DCMNR) and the Regional Fisheries Boards responsible for carrying out inspections. However, the enforcement of the legislation is deemed to be weak.

Further resources & reading:

- *National Biodiversity Action Plan, 2017 – 2021*

https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf

- *Invasive Species in Ireland*

https://www.npws.ie/sites/default/files/publications/pdf/Stokes_et_al_2004_IAS_Ireland.pdf

5. INNOVATIVE IAS SYSTEMS, TOOLS AND PRACTICES

In addition to the IAS management policies of both project partners' countries and non-participating EU-28 countries, this section aims to provide information regarding other IAS systems that are applied, and can be considered as good practice guide and best practices; this has been prepared by ICETA in the framework of INVALIS activity A.1.1.

The four cases presented below are also highly innovative, as they employ high capacity technological tools and software. The involvement of advanced technological systems increases applicability and accessibility, and therefore is important for the continuous development of IAS management.

5.1 Waarnemingen.be

Early warning systems as a sub-category of information systems are instrumental to IAS management. The purpose of early warning systems is real time storage of observations. The IAS directive recommends the development of early warning systems but allows MS to devise their own suitable means of achieving this objective. Minimum requirements for the operationalization of such systems are:

i) Identified species;

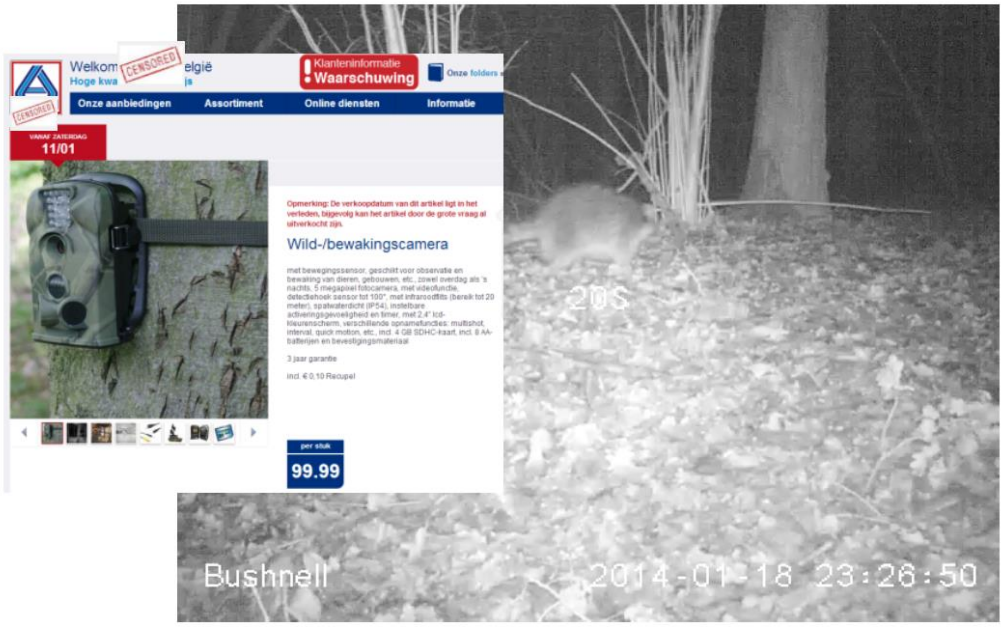
ii) Geo-referenced;

iii) Date recordings;

iv) Actual observers to record data. It is observed that early warning systems are increasingly developed and fine-tuned in the EU, making use of data-converging platforms, whilst validating data by experts. Last but not least, early warning systems are created to function as automated alert systems.

The Waarnemigen pilot test in Belgium revealed 3.3% share of IAS over total biodiversity. Through the early warning system it was possible to establish that non-native species doubled since 2009. The system is in use serving to inform decision making and the implementation of rapid response plans.

Information technology solutions promote interactive reporting, which has been proved to be a more efficient reporting solution, overcoming the obstacles associated with centralized reporting. What is more, these systems increase the potential for participation of ordinary citizens in biodiversity management, a qualified approach to data collection.



1 Snapshot of early warning tools and monitoring tools in action

5.2 Pandora+ & Harmonia+

Pandora and Harmonia are first-line risk assessment tools for pathogenic and parasitic micro-organisms and potentially invasive organisms. In more detail,

- Harmonia+ is a first-line risk assessment scheme for potentially invasive species.
- Pandora+ is a first-line risk assessment scheme for pathogenic or parasitic (micro) organisms that may be of concern to environmental, plant, animal or human health. It refers directly to a particular host organism, and as such, is designed to support assessments within Harmonia+.
- Pandora is a first-line risk assessment scheme for the risks posed by pathogenic and parasitic (micro) organisms. It is the counterpart of Harmonia+ for potentially invasive (macro) organisms.

Harmonia is a questionnaire based on a framework for assessment of invasions and the risk associated with them. Invasion risk analysis, required by EU legislation, combines qualitative and quantitative outputs and it is meant for use by expert panels. In addition, Harmonia is used as a tool for identification and prioritization of IAS.

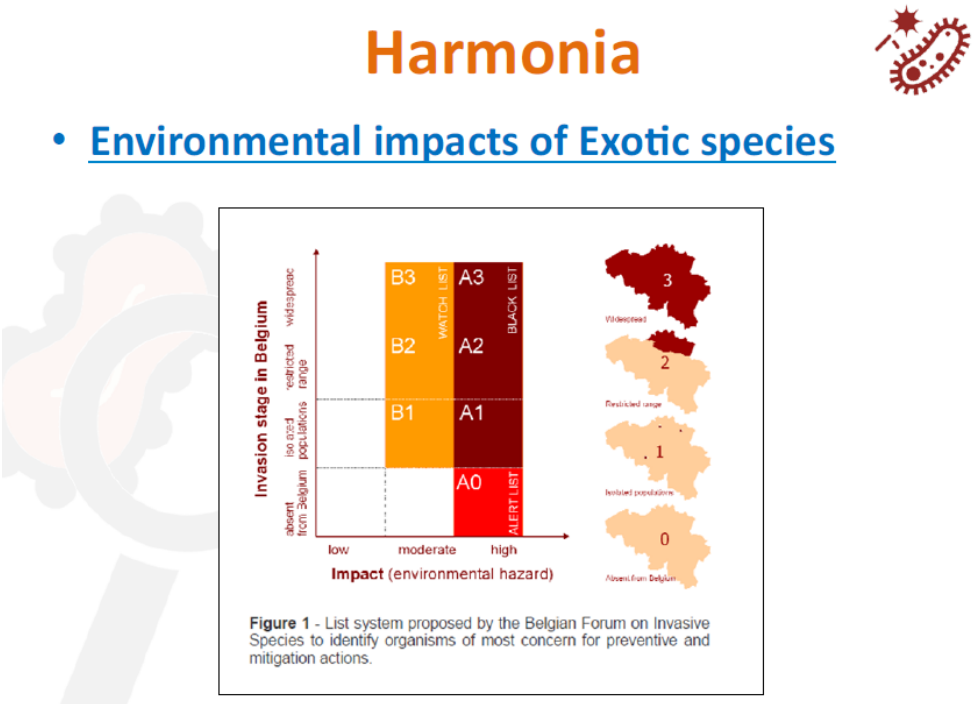
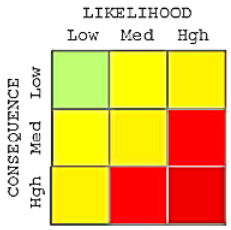


Figure 1 - List system proposed by the Belgian Forum on Invasive Species to identify organisms of most concern for preventive and mitigation actions.

RISK =
exposure x likelihood x consequence

Based on : Kinney & Wiruth (1976) Practical risk analysis for safety management. *NWC report*, California.



2 Snapshots from Harmonia⁺: a risk-screening procedure for alien species

Further resources:

- Inbo – Research Institute for Nature and Forest (2014). 'Waarnemingen.be as an early-detection tool: From centralized reporting to effective early warning'.
- For an overview of citizen science in biodiversity protection, see: EEA (2012). Overview of citizen science reporting for biodiversity in Europe'. Available online at: *https://bd.eionet.europa.eu/Reports/ETCBDTechnicalWorkingpapers/PDF/Overview_citizen_science_biodiversity_EU.pdf*

5.3 eDNA use for Early Detection & Eradication Monitoring (Slovenia)

Environmental DNA is an approach of detecting recent presence of target species. This approach foregoes the need for direct observation or trapping and the presence of very small populations (even up to one specimen). Environmental DNA presents the advantage that it allows detection of a specific animal literally anywhere (downstream) within the water body.

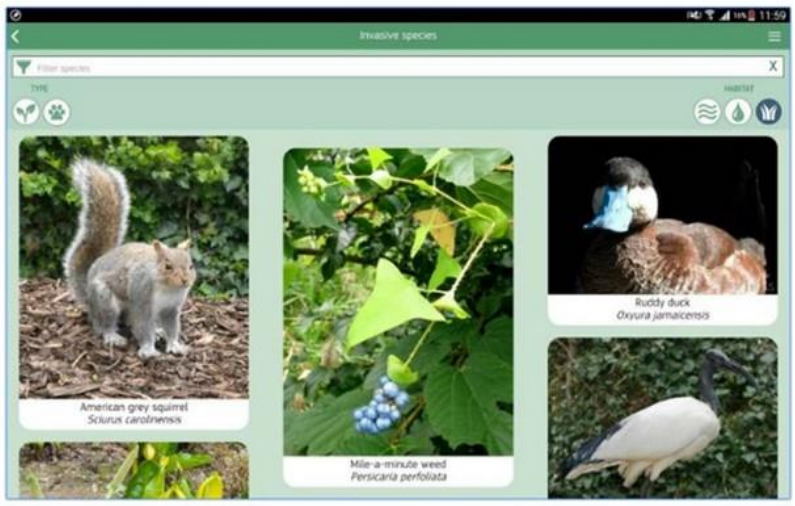
This approach is rather effective, as it can be combined with smart water sampling methods. It does presuppose however, the existence of a database of (likely) IAS to which the eDNA sampling shall refer to (Species specific primers). In addition, specialist labs are needed for the corresponding analysis. Aside considerable development costs, the actual implementation of the method is reasonably costly.

*"Prepare and make publicly available a database of labs that are able to do eDNA analysis in short time 'Ministry for the Environment and Spatial Planning, Slovenia" *IAS EG Meeting, 2018*

In addition to information systems being indispensable infrastructure for policy roll-out, the concept of citizen science is gaining purchase in the management of IAS. It is widely accepted that combining the two, for instance, by engaging citizens in observation and production of spatial data – to be validated by experts is a productive, multi-benefits approach that not only support environmental scientists to collect data, but also helps to raise awareness in a practical way, that is, by engaging individuals and groups in interactive reporting. In essence, 'citizen science' and IAS projects speak to the need for co-management schemes regarding policy issues of wide concern, such as biodiversity loss.

5.4 Invasive Alien Species Europe

Adopting the view that 'timely access to spatial data on IAS of Union concern is a key aspect for their successful management', the JRC launched a cross-platform application (Android & Apple App) called "Invasive Alien Species Europe". Everyone is permitted to have access and be able to use the application and report on species observed. The collected data is then fed to the EASIN information system, which 'integrates spatial data from distributed data sources, including MS national authorities and provides maps of species occurrences''.



Examples:

Mitten Crab Watch:

The full extent of these exotic pests in English and Welsh waters is currently unclear and a consortium of research institutes is requesting mitten crab sightings from members of the public, anglers and waterway workers, to clarify the distribution of this species. The MBA plays a key role in maintaining the scheme and sharing sightings. (UK)

Mosquito Atlas:

The "Mückenatlas" (mosquito atlas) is a typical, and extraordinarily successful, citizen science project which went online in April 2012. Citizens are asked to collect culicid mosquitoes in their private surroundings, kill them by freezing and send them to the involved research institutions. (DE)

Further reading & resources:

Citizen science projects:

- Ambrosia Scout
  https://lfu.brandenburg.de/info/ambrosia_scout
- Invasive Alien Species Europe
  http://easin.jrc.ec.europa.eu

  http://digitalearthlab.jrc.ec.europa.eu/mygeoss/apps_jrc.cfm
- Tsiamis, K. et al. (2017). *Citizen science application – Invasive Alien Species in Europe.*

  *L*uxemburg: Publications Office of the European Union.

6. FINDINGS ON IAS MANAGEMENT POLICIES AND REGULATIONS

This section, compares and contrasts the input provided by Project Partners in order to pinpoint the most common issues and the most crucial differences concerning the implementation of similar or different IAS management systems throughout Europe. Given the information provided in section 3, it apparent at first glance that even if project partners have proceeded to the adoption and implementation in certain cases of the EU Regulations, the quality and level of implementation differs from case to case. In particular, each territory may face difference kind of problems in the implementation of the policy measure, or different barriers. Similarly, a policy measure may be either beneficial or harmful for the local economy of a territory. Finally, there are two aspects addressed in this section; the first relates to awareness raising and the second to conflicts of interests.

6.1 Common issues and main differences across partners' policies

To begin with, it is certain that most of the questions have been adequately answered. However, it is important to mention that not all partners participating in the survey, were able to gather and provide specific data on certain matters. The latter can be considered as a limitation of the research, nevertheless it does not affect gravely the analysis. The following findings are drawn from analysis of partners' answers for the open-ended questions of the survey.

How would you describe the policy found in the data?

As a description of the policies under evaluation in each territory, it is visible at first glance that are all multifaceted, except from the Order 979/2009 implemented in Romania, which is a single action policy measure.

Which of the following aspects of policies for addressing the issue of invasive alien species are addressed by the policy under evaluation?

Subsequently, the Spanish, Corsican and Italian territories use all the prevention policies included in the survey. As far as early detection and rapid eradication policies are concerned,

three aspects are addressed by policies implemented in Lombardy and Italy, by the Plan of Action for the Vigilance and Control of *Vespa Velutina* and by the French Orders of the 14th of February 2018. In particular, the first aspect relates to the establishment of a surveillance system of IAS of concern of the territory or the EU as a whole collecting and recording data on the occurrence in the environment of IAS by survey, monitoring or other procedures. The second aspect addressed comprise the introduction of an early detection notification system ensuring the detection and reporting of the introduction or presence of IAS of EU or territorial concern. Finally, the third aspect encourages the development and application of rapid eradication of IAS procedures that are effective in achieving the complete and permanent removal of the population of the IAS concerned. Furthermore, consensus is observed regarding policies for the management of IAS that are already widely spread, as 7 out of 10 policy instruments address both aspects.

To what extent do you think that the policy measure under evaluation can further specify and optimize the application of EU regulation?

It is observed that the majority of the policy measures under evaluation are considered significantly useful to optimize and make more specific the application of the EU regulation.

Does the policy under evaluation address IAS spread in terrestrial, marine ecosystems or both?

According to data, 6 out of 10 policy instruments address IAS spread in both marine and terrestrial ecosystems, while the rest address only terrestrial ecosystems.

If terrestrial/both which types of terrestrial ecosystems are protected through the policy under evaluation?

In particular for the first category, (Policies in Lombardy and Zemgale, as well as the Plan of Action for the Vigilance and Control of *Vespa Velutina* and Regional Plan for the Eradication and Control of Invasive Plant Species in Sensitive Areas), most policy measures protect all the types of ecosystems except from ice-associated marine habitats, which are not observed in the territories under evaluation.

To what extent do you think the policy under evaluation has a negative impact on the economy?

Regarding the negative impacts on the economy, data differ. Moderate impacts are observed for policies in Italy, Lombardy, Zemgale and Corsica. Small impacts derive from policies in Greece, Portugal while no impact derives from policies in Extremadura and the Azores. Only the Plan of Action for the Vigilance and Control of *Vespa Velutina* is considered to bear considerably negative impacts, while for Romanian Orders there is no available data estimating the results and impacts.

Which of the following barriers do you think constrain the implementation of the policy under evaluation?

As it is generally observed in public policy, policy measures are usually facing barriers that constraint their development and implementation. For the policy measures on the management of IAS under evaluation, the most important barrier according to data is the low public awareness and/or opposition to government intervention. The latter is faced in the implementation procedure of all policy instruments. The second most frequently experienced barrier in the policy measures under evaluation is the inadequate monitoring capacity (in every policy instrument except the Romanian order). The third barrier is the poor co-ordination between government agencies, states and other stakeholders (6 out of 10 policy instruments). Finally, the least faced barrier is the shortage and inaccessibility of scientific information (for species identification, risk analysis, detection and mitigation techniques etc.).

Are there any enablers that facilitate the application of the policy under evaluation?

As it is observed almost in every policy measure, only few enablers are actively engaged and can be considered as facilitators for their application.

Did the policy under evaluation lead to a decrease to the de novo introductions of invasive alien species?

It is also observed that half of the policy measures under evaluation have led to a decrease to the de novo introductions of IAS. The Greek and Romanian policies as well as the Portuguese

regional plan have not led to any decrease, while for the remaining policies there are no available data.

To which extent did the policy under evaluation lead to a decrease in the population/diffusion of invasive alien species?

Concerning the potential decrease in the population or diffusion of IAS, the policies are proportionately stand between no decrease and considerable decrease, while it is certain that no large decrease is estimated.

Did the policy under evaluation have a positive or a negative impact on the economy of the territory? / Did the policy under evaluation have a positive or a negative social impact in the territory?

Finally, as far as economic impacts and social impacts on the territory are concerned, it is apparent that the result is neither positive, nor negative, therefore neutral.

6.2 Promoting awareness raising and involvement and assessing conflict of interests

6.2.1 Awareness raising:

Awareness raising is crucial in order to promote, encourage and motivate for efficient IAS management. Supporting states, businesses, local and regional organizations to engage the public into actions could contribute significantly to decreasing the threat of IAS. Key stakeholders could play a vital role as well in the implementation of IAS management. According to research in order to put in place all the aforementioned will require:

- The development of public awareness campaigns to support IAS management, including information sharing and coordination so to circumvent ambiguity and maximize efficiency.
- The utilization of adequate pilot projects on IAS with high priority, or disturbing main native species, as a basis for raising public awareness, validating investment in rapid response and management systems and building capacity through practice;
- The engagement of key stakeholders, communities and neighbors in creating solutions to the problem by linking IAS strategies wherever possible to integrated development programs (e.g. programs focusing on poverty alleviation measures);
- The capacity building of local communities and groups to implement IAS management measures in their territories
- The experience sharing with other entities via documentation, staff exchanges, and by other means.

6.2.2 Conflicts of interests:

Conflicts between stakeholders can hamper environmental management actions. Stakeholders' engagement, by considering more comprehensive information inputs is recognized as essential for developing effective, equitable, sustainable and conflict-free environmental management strategies. IAS can lead both to beneficial and negative impacts.

According to literature, the majority of these conflicts could be clarified by more than one cognitive level, such as utilitarian values grounded on practical or material profits and risk perceptions of possible impacts from IAS. The main types of conflicts are demonstrated below:

Conflicts because of perception:

One of the most regular causes of conflict of interested is perception. The latter has led to conflicts between communities who perceive the species as a resource (farmers and NGOs) and others who are concerned and skeptic about its negative effects (conservation managers and farmers) (Shackleton et al. 2015c). Likewise, acacia species, for example, are commercially vital and contribute to livelihoods but are simultaneously hostile invaders that have substantial ecological impacts introducing major conflicts of interests (De Wit et al. 2001; Shackleton et al. 2007).

Conflicts because of conflict-generating species:

Furthermore, it is apparent that in certain cases, the research process on biological control can be affected because of conflict-generating species. Species in this category have both benefits and negative impacts, while the majority of these conflicts could be explained by more than one cognitive level. Depending on the species under evaluation and the engagement of different types of stakeholders involved, the research process may be delayed or even finish.

Value-based conflicts:

In some cases, IAS are associated with different conflict types that could entail either intrinsic or utilitarian values being attached to them. The intrinsic (naturalistic and aesthetic) values derive from the physical attraction and appeal of nature, while utilitarian values emphasize on derived practical or material benefits from the particular IAS under evaluation (Allsopp & Cherry 2004; van Wilgen 2012).

Conflicts centered on intrinsic values usually signify some form of the emotional relationship amid society and nature. Value systems include naturalistic, humanistic, aesthetic and moralistic values systems. For example, moralistic values support that invasive animals should let to live and not be put to any risk of abuse. It is observed that to some extent, control

measures often involve culling. The latter is very aggressively opposed by diverse sectors, especially by animal rights organizations (Bremner & Park 2007; Ford-Thompson et al. 2012).

Conflicts based on the utilitarian approach are usually witnessed for species that are economically significant for food and raw materials' production for both industries and local/regional communities. Many cactus species, for instance, are hosted as part of agricultural initiatives facilitating the improvement of fruit production for consumption, fodder for livestock and ornamental purposes (Novoa et al. 2015a). At the same time, some of these species bear negative implications, and more specifically cause confrontational ecological impacts, leading consequently to conflicts between the different sides of stakeholders (Novoa et al. 2015).

General discussion on conflict of interests:

There are numerous approaches that can be implemented in order to facilitate stakeholders and managers reaching common ground in such quarrelsome situations. According to Liu et al. (2011), one valuable method is the deliberative multi-criteria evaluation approach. According to the latter, participants need to assess the different risk factors associated with managing a particular species, and by assigning risk weighting to dissimilar management strategies, plan the management approach, estimated to bear the least conflict among the stakeholders (Liu et al. 2011; Woodford et al. 2016).

Species that are on the verge (i.e. scoring high on the benefits), but average on the negative impacts (and vice versa) should be prioritized for directed research, as they focus on areas where new conflicts might arise.

Most conflicts that have occurred to the management of IAS could be probably elucidated by more than one value system (intrinsic vs. utilitarian) and cognitive level (values systems vs. risk perception). Value-based conflicts are inherently challenging to resolve, because management authorities have to balance the needs of different stakeholders, while still preserving the environment and the ecosystems.

A model management plan requires parties with different value systems to reach consensus on a win-win solution, where IAS management can lead to considerable benefits. The latter

also requires that adverse impacts should be reduced. This scheme can be put to test and prove itself feasible only via open dialogue among stakeholders, trade-offs, concessions, and compromises. In cases where the perceived benefits outweigh impacts, the management tactic has normally been to tolerate the species and monitor whether they will have potential future impacts. In contrast, when the impacts outweigh perceived benefits, management options involve trade-offs and compromises that have minimized the impact of the IAS but reserve a large proportion of their amenity values.

In extreme cases, control efforts have proceeded despite opposition because of a strong body of scientific evidence and political support. Conflicts based on risk perception usually originate from the fear and aversion of impacts of the IAS or the control methods proposed for their management.

However, the small proportion of species identified as conflict-generating hold the potential to negatively impact the future efficiency of conservation management by forcing regulators and managers to spend great amounts of time and resources addressing stakeholder complaints and concerns instead of discharging their duties in dealing with the species that do not generate controversy.

When assessing the ideal strategy to deal with conflict-generating species, it is critical to identify all stakeholders at the outset and to recognize that they might hold severely divergent insights on the issues posed by IAS (Woodford et al. 2016). Finally, when these issues are confronted from the beginning of the development of management plans, and when stakeholders are directly involved to determine their perceptions of the risks posed by these species, the possibility of arriving at applied, reasonable and non-controversial management strategies can be prominently increased.

7. GUIDELINES ON HOW TO IMPROVE PARTNERS' POLICY INSTRUMENTS BASED ON COMPARATIVE ANALYSIS RESULTS.

This sections provides guidelines in order to ensure that appropriate legislation is enforced, policies, protocols and procedures are in place, and operations towards the effective management of IAS are sufficiently implemented by Project Partners and EU Member States in general.

In this framework, three crucial points have to be considered firstly:

- Identification and prioritization of areas needing action within each country's jurisdiction.
- Designation of a tailor-made IAS strategy and adequate planning programme, based on the principles and already existing regulations on IAS.
- Determination of how to actively coordinate with other countries and regional organizations, and benefit from shared experiences and assistance.

Invasive species can lead to economic, environmental, social and cultural impacts, so their management should engage many different entities. Adequate, consistent legislation, agreed protocols, general compliance and effective enforcement are vital for harmonized, operational action. The quality and capacity of laws and protocols may be completed and robust, and therefore require only promoting, implementing or enforcing; or may be incomplete and

loose, and therefore require an innovation in the regulatory system or further strengthening.

In this framework, in order to optimize the existing policy instruments, project partners, depending on their needs and situation, should consider to adopt and implement some or all of the following measures:

- Review environmental, fisheries, agricultural, aqua-cultural, forestry, horticultural and bio-security legislation in each Member State's territory to determine their capability and competence for protecting biodiversity, economies and health against invasive species, identifying gaps, inconsistencies and conflicts.
- Improve, disseminate and adopt practical legislative guidelines covering all activities affecting IAS management. The latter may encompass export-import, trade, transport, construction, military activities, emergency reflexes, scientific research, aquaculture, horticulture, agriculture, tourism, surveillance, risk analysis, biocontrol, eradication, declaration of noxious pests etc.
- Ensure the full participation by all stakeholders, including local communities, in the development and implementation of legislation.
- Develop mechanisms to improve compliance with and enforcement of IAS legislation.
- Periodically review existing national and regional policies and procedures to manage trade, movement, holding, release into the environment, establishment and management of invasive species.
- Develop model technical protocols and procedures, enabling countries to use best practice in developing or modifying their internal procedures.
- Raise awareness on biological invasions at all levels. The latter could be utilized as a focal point for the diffusion of information and knowledge on biological invasions at all levels, involving from staff and managers to visitors, to local communities and the general public. Awareness on IAS could furthermore be raised and strengthened via the involvement of public in the diverse activities related to the monitoring and management of IAS.

- Integrate invasive species and protected area management. Activities on IAS in protected areas should be based on a priority setting exercise, so as to sustainably manage the available resources, directing them in a way that allows to minimize the effects of IAS (Randall, 2011).
- Implementation and prioritization of site-based prevention actions. Responsible attitude by private individuals and industries should be encouraged. Furthermore IAS management could comprise the on-going assessment of site-specific activities and vectors responsible of IAS entries, and developing policies and measures to lessen the risk of potential future invasions. In this regard potential new invaders should be acknowledged, while forecasts made of what IAS are expected to be introduced, in order to intercept them when possible.
- Staff capacity development for all aspects of IAS management. Acknowledged and well trained staff is vital for effective IAS management. Therefore providing trainings would be very assisting to creating adequate personnel that will further contribute to communicate the IAS issues to public.
- Set up rapid detection and prompt response framework:
  - To enable more effective early detection and rapid response system (by including species identification, risk assessment, information sharing, and selection and enforcement of actions)
  - Adequate support from the public
  - Contingency plans, including training on management alternatives, and possibly the establishment of dedicated task forces (created either in protected areas or regionally)
- Implement policies to establish surveillance, monitoring and information exchange networks. Promote standardized collection of data on the distribution and abundance of IAS (Pyšek et al. 2014). Citizen science could significantly improve efficacy of surveillance and monitoring of IAS, as well as other databases and online mobile applications such as:
  - "PlantTracker" http://planttracker.naturelocator.org/
  - "Aliens Among Us app" http://www.royalbcmuseum.bc.ca/TravellingExhibitions/default.aspx

- "What'invasive!" http://whatsinvasive.com/
- "Eye on earth" http://www.eyeonearth.org/en-us/Pages/Home.aspx

- Lobby with institutions and decision-makers to support stringent policies.
- Comprise climate-dissemination modelling under the auspices of IPCC (International Panel on Climate Change) climate scenarios in horizon scanning to identify and classify alien species that have the potential to be invasive in the future, caused by the emerging developments in climate change, and to monitor species with a low risk of invasion.
- Encourage the establishment of a national authority, or a similar mechanism or network in order to coordinate the efforts of agencies and governments which are responsible for the policies regulating the management of IAS.
- Intensify the collaboration with equivalent national focal points for relevant instruments and organizations in order to further develop, advance and implement national and regional IAS strategies and strengthen the responsiveness systems. Instruments and organizations could possibly include CBD, GISP, Ramsar, CMS, UNESCO Man and the Biosphere Programme, IMO, IPPC/EPPO etc.
- Develop and disseminate action plans in order to address and eventually confront specific problems identified, e.g. for priority IAS, pathways and vectors, vulnerable sites, ecosystems, etc.
- Endorse the establishment of criminal/administrative sanctions and appropriate penalties, consistent with national policy or legislation, for cases where illegal IAS introductions are identified, or movement or holding of IAS is recorded.
- Develop and introduce procedures to deliver any available information on a species' invasive behaviour (or the invasive potential of a species) to neighbouring countries, trading associates and countries with analogous ecosystems and histories of invasion. The latter should be implemented at a time prior to the determination of a particular species, as invasive. For example, intentional transfer to another state of potentially IAS, even if it is harmless in the state of origin (e.g.: export of wild boar, hare, etc., to states outside the natural range of these species, for release into the wild).
- Evaluate the prerequisite to adjust standing licensing rules for containment facilities holding potential IAS (e.g. botanic gardens, greenhouses, arboreta, garden centres, zoos,

animal-breeding establishments, fish farms, research institutes). Existing licensing and control systems (e. g. in plant health) should only be used where appropriate.

- A trial eradication procedure could be a valuable tool to assemble information and data for the assessment (e.g. bait preference and acceptance to target species, risk of destruction of non-target species, ways to minimise this risk, etc.), which should potentially determine the likelihoods of success when attempting to address worst case scenarios.
- Encourage the further adoption of strong laws and their enforcement against illegal releases. At this basis, practices could considerably valuable in limiting risk factors such as recreational hunting on public lands for example. To determine the efficiency and feasibility of this measure, education programs should be established in order to discourage releases and endorse public reporting.

8. ANNEX DATA COLLECTION TOOL

Data collection tool:

Criterion 1:	
Question 1	
Could you describe the problems addressed by the policy under evaluation?	
Question 2	
How would you describe the policy found in the data?	
A. As a single action	
B. As a multifaceted policy	
Question 3 (A)	
If (A) which is the aspect of policies for addressing the issue of invasive alien species that the policy under evaluation builds upon?	
Prevention policies:	
1. A number of compulsory restrictions imposed upon the intentional introduction of IAS or upon any actions that could introduce them unintentionally.	
2. A system for granting permits, including methods and criteria for the introduction of IAS under controlled conditions when there are specific economic, social or health related reasons.	
3. A number of emergency measures to be taken when a territory has evidence concerning the presence in, or imminent risk of introduction into its territory of an invasive alien species, which is not included on the EU list but which the competent authorities have found, on the basis of preliminary scientific evidence.	
4. Elaboration of a process and criteria for the development of action plans for the efficient prevention of IAS introduction.	
Early detection and rapid eradication policies:	
5. Establishment of a surveillance system of invasive alien species of concern of the territory or the EU as a whole which collects and records data on the occurrence in the environment of invasive alien species by survey, monitoring or other procedures.	
6. Introduction of a system of official controls applied to the production and trade of specific categories of goods so as to minimise any possibility of introduction of IAS and eradicate any small populations already established.	
7. Put in place of an early detection notification system that ensures the detection and report of the introduction or presence of invasive alien species of EU or territorial concern.	

8. Development and application of rapid eradication of IAS procedures that are effective in achieving the complete and permanent removal of the population of the invasive alien species concerned, with due regard to human health and the environment, especially non-targeted species and their habitats, and ensuring that animals are spared any avoidable pain, distress or suffering.	
Policies for the management of invasive alien species that are already widely spread:	
9. Lethal or non-lethal physical, chemical or biological actions aimed at the eradication, population control or containment of a population of an invasive alien species.	
10. Appropriate restoration measures to assist the recovery of an ecosystem that has been degraded, damaged, or destroyed by invasive alien species of Union concern unless a cost-benefit analysis demonstrates, on the basis of the available data and with reasonable certainty, that the costs of those measures will be high and disproportionate to the benefits of restoration.	

Question 4 (A)

If (A) to what extent do you think that the policy measure under evaluation can further specify and optimise the application of EU regulation?

Not at all	A little	Somewhat	Significantly	Greatly

Could you justify your opinion and describe how the policy measure under evaluation can further specify and optimise the application of EU regulation?

Question 3 (B)

If (B) which of the following aspects of policies for addressing the issue of invasive alien species are addressed by the policy under evaluation?

Prevention policies:	
1. A number of compulsory restrictions imposed upon the intentional introduction of IAS or upon any actions that could introduce them unintentionally.	
2. A system for granting permits, including methods and criteria, for the introduction of IAS under controlled conditions when there are specific economic, social or health related reasons.	
3. A number of emergency measures to be taken when a member State has evidence concerning the presence in, or imminent risk of introduction into its territory of an invasive alien species, which is not included on the Union list but which the competent authorities have found, on the basis of preliminary scientific evidence.	
4. Elaboration of a process and criteria for the development of action plans for the efficient prevention of IAS introduction.	
Early detection and rapid eradication policies:	

5. Establishment of a surveillance system of invasive alien species of Union concern which collects and records data on the occurrence in the environment of invasive alien species by survey, monitoring or other procedures.	
6. Introduction of a system of official controls applied to the production and trade of specific categories of goods so as to minimise any possibility of introduction of IAS and eradicate any small populations already established.	
7. Put in place of an early detection notification system that ensures the detection and report of the introduction or presence of invasive alien species of EU or member state concern.	
8. Development and application of rapid eradication of IAS procedures that are effective in achieving the complete and permanent removal of the population of the invasive alien species concerned, with due regard to human health and the environment, especially non-targeted species and their habitats, and ensuring that animals are spared any avoidable pain, distress or suffering.	
Policies for the management of invasive alien species that are already widely spread:	
9. Lethal or non-lethal physical, chemical or biological actions aimed at the eradication, population control or containment of a population of an invasive alien species.	
10. Appropriate restoration measures to assist the recovery of an ecosystem that has been degraded, damaged, or destroyed by invasive alien species of Union concern unless a cost-benefit analysis demonstrates, on the basis of the available data and with reasonable certainty, that the costs of those measures will be high and disproportionate to the benefits of restoration.	

Question 4 (B)

If (B) to what extent do you think that the policy measure under evaluation can further specify and optimise the application of EU regulation?

Not at all	A little	Somewhat	Significantly	Greatly

Could you justify your opinion and describe how the policy measure under evaluation can further specify and optimise the application of EU regulation?

Question 5

Could you provide a description of the policy?

Criterion 2

Question 6

How many kinds of invasive alien species (from those listed as invasive by the EU that are relevant to your territory) can be confronted by the policy under evaluation?	Number of species controlled through the policy

Can you provide a list with the IAS the spread of which is tackled through the policy?

Question 7	
Does the policy under evaluation address IAS spread in terrestrial, marine ecosystems or both?	
A. Terrestrial	
B. Marine	
C. Terrestrial & Marine	
Question 8 (A)	
If terrestrial, which types of terrestrial ecosystems are protected through the policy under evaluation?	
1. Inland surface waters	
2. Mires, bogs and fens	
3. Grasslands and land dominated by forbs, mosses or lichens	
4. Heathland, scrub and tundra	
5. Woodland, forest and other wooded land	
6. Inland unvegetated or sparsely vegetated habitats	
7. Regularly or recently cultivated agricultural, horticultural and domestic habitats	
8. Constructed, industrial and other artificial habitats	
Question 8 (B)	
If marine, which types of marine ecosystems are protected through the policy under evaluation?	
1. Littoral rock and other hard substrata	
2. Littoral sediment	
3. Infralittoral rock and other hard substrata	
4. Circalittoral rock and other hard substrata	
5. Sublittoral sediment	
6. Deep-sea bed	
7. Pelagic water column	
8. Ice-associated marine habitats	
9. Estuaries and coastal lagoons	

10. Coastal habitats (Coastal dunes and sandy shores, coastal shingle, rock cliffs, ledges and shores)	
Question 8 (C)	
If both, which types of ecosystems are protected through the policy under evaluation?	
1. Inland surface waters	
2. Mires, bogs and fens	
3. Grasslands and land dominated by forbs, mosses or lichens	
4. Heathland, scrub and tundra	
5. Woodland, forest and other wooded land	
6. Inland unvegetated or sparsely vegetated habitats	
7. Regularly or recently cultivated agricultural, horticultural and domestic habitats	
8. Constructed, industrial and other artificial habitats	
9. Littoral rock and other hard substrata	
10. Littoral sediment	
11. Infralittoral rock and other hard substrata	
12. Circalittoral rock and other hard substrata	
13. Sublittoral sediment	
14. Deep-sea bed	
15. Pelagic water column	
16. Ice-associated marine habitats	
17. Estuaries and coastal lagoons	
18. Coastal habitats (Coastal dunes and sandy shores, coastal shingle, rock cliffs, ledges and shores)	
Question 9	
To what extent do you think the policy under evaluation has a negative impact on the economy?	

No impact at all	Small impact	Moderate impact	Large impact	Immense impact

Could you briefly describe the economic impact?
Question 10
Which of the following barriers do you think constrain the implementation of the policy under evaluation?

1. Low public awareness and/or opposition to government intervention	

2. Shortage and inaccessibility of scientific information (for species identification, risk analysis, detection and mitigation techniques etc.)	
3. Absence of clear and agreed priorities for action	
4. Ease of introduction and movement (e.g. through the post)	
5. Inadequate inspection and quarantine	
6. Inadequate monitoring capacity	
7. Lack of effective emergency response measures	
8. Outdated or inadequate legislation	
9. Poor co-ordination between government agencies, states and other stakeholders	
Could you please briefly describe the barriers?	

Question 11				
Are there any enablers that facilitate the application of the policy under evaluation?				
No enablers at all	A few enablers	Moderate number of enablers	Significant number of enablers	Large number of enablers
Could you please briefly describe the enablers?				

Criterion 3		
Question 12		
Did the policy under evaluation lead to a decrease to the de novo introductions of invasive alien species?	**YES**	
	NO	
If yes could you please describe how?		

Question 13				
To which extent did the policy under evaluation lead to a decrease in the population/diffusion of invasive alien species?				
No decrease at all	Slight decrease	Moderate decrease	Considerable decrease	Large decrease
Could you please describe the reasons why this policy led to this result?				

Question 14				
Did the policy under evaluation have a positive or a negative impact on the economy of the territory?				
Largely negative	Slightly negative	Neutral	Slightly positive	Largely positive
Could you please describe the type of impact this policy had and the reasons why this policy led to this result?				
Question 15				
Did the policy under evaluation have a positive or a negative social impact in the territory?				
Largely negative	Slightly negative	Neutral	Slightly positive	Largely positive
Could you please describe the type of impact this policy had and the reasons why this policy led to this result?				

BIBLIOGRAPHY AND RESOURCES

Books & journal papers

- Allsopp, M. & Cherry, M., 2004, *Assessment of the economic impact on the bee and agricultural industries in the Western Cape of the clearing of certain Eucalyptus species*, Agricultural Research Council, Stellenbosch, South Africa.
- Ana Novoa, Ross Scackleton, Susan Canavan, Cathleen Cybele, Sarah J. Davies, Katharina Dehnen-Schmutz, Jana Fried, Mirijam Gaertner, Sjirk Geerts, Charles L. Griffiths, Haylee Kaplan, Sabrina Kumschik, David C. Le Maitre, G. John Measey, Ana L. Nunes, David M. Richardson, Tamara B. Robinson, Julia Touza, John R. U. Wilson, A framework for engaging stakeholders on the management of alien species, Journal of Environmental Management, Volume 205, 1 January 2018, p 286-297
- Balázsi Ágnes (2016). *Grassland Management in Protected Areas. A study on the implementation of the EU Biodiversity Strategy in Certain Post-Communist Countries*. Environmental Sciences Department: Sapientia Hungarian University of Transylvania.
- Bremner, A. & Park, K., 2007, 'Public attitudes to the management of invasive non-native species in Scotland', *Biological Conservation* 139, 306-314. https://doi.org/10.1016/j.biocon.2007.07.005
- Carboneras, C. et al. (2017). A prioritized list of invasive alien species to assist the effective implementation of EU legislation. Journal of Applied Ecology. 54: 5. Available online at: *https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.12997*.
- De Wit, M., Crookes, D. & van Wilgen, B.W., 2001, 'Conflicts of interest in environmental management: Estimating the costs and benefits of a tree invasion', *Biological Invasions* 3, 167-178. https://doi.org/10.1023/A:1014563702261
- Deriu, I. et al. (2017). 'Handling Big Data of Alien Species in Europe: the European Alien Species Information network Geodatabase'. Frontiers in ICT, 4, pp. 1-8.
- Genovesi, P. & Carboneras, C. (2014). 'EU adopts innovative legislation on invasive species: a step towards a global response to biological invasions?'. *Biological Invasions*. DOI: 10.1007/s10530-014-0817-8

- Katsnevakis, S. et al. (2015). European Alien Species Information Network (EASIN): supporting European policies and scientific research'. *Management of Biological Invasions*, pp.
- Kettunen, M. et al. (2008). *Technical Support to EU Strategy on Invasive Alien Species (IAS): assessment of the impacts of IAS in Europe and the EU.* Brussels: Institute for European Environmental Policy.
- Kočovský, P. (2018). What it is to be established: policy and management implications for non-native and invasive species. *Management of Biological Invasions*. 9:3, pp. 177-185.
- Liu, S., Sheppard, A., Kriticos, D. & Cook, D., 2011, 'Incorporating uncertainty and social values in managing invasive alien species: A deliberative multi-criteria evaluation approach', *Biological Invasions* 13, 2323-2337. https://doi.org/10.1007/s10530-011-0045-4
- Madsen, C. L. et al. (2014). 'Pathways for non-native species in Denmark'. Department of Geosciences and natural resource management: University of Copenhagen. IGN Report
- McNeely J.A et al (eds.), 2001. *A Global Strategy on Invasive Alien Species.* Shine, C., N.Williams and L.Gundling, 2000. *A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species* (IUCN Environmental Policy and Law Paper No.40).
- Novoa, A., Le Roux, J.J., Robertson, M.P., Wilson, J.R.U. & Richardson, D.M., 2015a, 'Introduced and invasive cactus species: A global review', *AoB Plants* 7, plu078. https://doi.org/10.1093/aobpla/plu078
- Pergl, J. et al. (2016). *'Black, Grey and Watch Lists of Alien Species in the Czech Republic based on environmental impacts and management strategy'*. NeoBiota. 28, pp. 1-37.
- Piria, M. et al. (2017). 'Tackling invasive alien species in Europe II: threats and opportunities until 2020'. *Management of Biological Invasions*, 8:3. pp.: 273-286.
- Pyšek P, Genovesi P, Pergl J et al (2014) Chapter 11: Invasion of protected areas in Europe: an old continent facing new problems. In: Foxcroft LC, Richardson DM, Pyšek P et al (eds) Plant invasions in protected areas: patterns, problems and challenges. Springer, Dordrecht
- Randall J (2011) Protected areas. In: Simberloff D, Rejmánek M (eds) Encyclopedia of biological invasions. University of California Press, Berkeley and Los Angeles, p 563–567

- Shackleton, R.T., Le Maitre, D.C. & Richardson, D.M., 2015c, 'Stakeholder perceptions and practices regarding *Prosopis* (mesquite) invasions and management in South Africa', *Ambio* 44, 569-581. https://doi.org/10.1007/s13280-014-0597-5
- Trichkova, R. et al. (2016). ESENIAS Scientific Reports 1. *State of the art of alien species in South-Eastern Europe*. University of Novi Sad Faculty of Sciences, Novi Sad, Serbia, IBER-BAS, ESENIAS.
- Vanderhoeven S. et al. (2017) 'Tracking Invasive Alien Species (TrIAS): Building a data-driven framework to inform policy'. *Research Ideas and Outcomes 3:* e13414.
- Vanderhoeven, Sonia. (2017) *Tracking Invasive Alien Species* (TrIAS): *Building a data-driven framework to inform policy. Available online at: https://doi.org/10.3897/rio.3.e13414*.
- Wittenberg R. and M. Cock, 2001. *Invasive Alien Species: A Toolkit of Best Prevention.*
- Woodford, D.J., Richardson, D.M., MacIsaac, H.J., Mandrak, N., van Wilgen, B.W., Wilson, J.R.U. et al., 2016, 'Confronting the wicked problem of managing invasive species', *Neobiota* 31, 63-86. https://doi.org/10.3897/neobiota.31.10038
- Zengeya, Tsungai, Ivey, Philip, Woodford, Darragh J., Weyl, Olaf, Novoa, Ana, Shackleton, Ross, Richardson, David, & van Wilgen, Brian. (2017). Managing conflict-generating invasive species in South Africa: Challenges and trade-offs. *Bothalia - African Biodiversity & Conservation, 47*(2), 1-11. https://dx.doi.org/10.4102/abc.v47i2.2160

Reports

- Available online at: *https://biodiversity.europa.eu/mtr/mtr_country_reports.docx*.
- BISE. (2015). *Member states contribution to the mid-term review of the EU biodiversity strategy to 2020*.
- DAISIE. (2010). *Handbook of Alien Species in Europe*. Springer.
- European Commission – DG ENV. (2011). *A Comparative Assessment of Existing Policies on Invasive Species in the EU Member States and in Selected OECD countries*. Paris: BIO Intelligence Service
- European Commission – DG for Internal Policies (2013). *Workshop on Invasive Alien Species*.

- European Commission. (2014). *Invasive Alien Species: a European Response*. Luxembourg: Publications Office of the European Union.
- European Environment Agency (2010). *Towards an early warning and information system for invasive alien species (IAS) threatening biodiversity in Europe*. Copenhagen: Publications Office of the European Union.
- European Environment Agency (2012*). Invasive alien species indicators in Europe: a review of streamlining European biodiversity (SEBI) Indicator 10*. Copenhagen: Publications Office of the European Union.
- Monaco, A. Genovesi, P. (2014). *European Guidelines on Protected Areas and Invasive Alien Species*. Council of Europe, Strasbourg, Regional Parks Agency, Rome.
- Monaco, A. Genovesi, P. (2016). 'European Code of Conduct on Hunting and Invasive Alien Species. Council of Europe, Strasbourg, Regional Parks Agency, Rome.
- Policy Brief, Action on invasive alien species should better anticipate climate change effects on biological invasions in Europe, www.biodiversa.org/policybriefs
- Shine, C. (2008). A toolkit for developing legal and institutional frameworks for invasive alien species. Global Invasive Species Programme. Nairobi.
- Shine, C. et al. (2008). *Technical Support to EU Strategy on Invasive Alien Species on biodiversity in Europe and the EU: policy options to control the negative impacts of IAS on biodiversity in Europe and the EU*. Brussels: Institute for European Environmental Policy (IEEP).
- Shine, et al. (2009). Technical support to EU strategy on invasive species (IAS) – Analysis of the impacts of policy options/measures to address IAS (Final module report for the European Commission). UNEP-WCMC/Institute for European Environmental Policy (IEEP).Brussels,
- Tsiamis, K. et al. (2017). *Citizen science application – Invasive Alien Species in Europe.* Luxemburg: Publications Office of the European Union.
- Tsiamis, K. et al. (2019). *Baseline distribution of species listed in the 1st update of Invasive Alien Species of Union Concern*. Luxembourg: Publications Office of the European Union.

- UCN (2013) Guidelines for reintroductions and other conservation translocations. Adopted by SSC Steering Committee, 5th September 2012. IUCN SSC Reintroduction Specialist Group and Invasive Species Specialist Group

Regulations & recommendations

- EC REGULATION (EU) No 1143/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 October 2014 *on the prevention and management of the introduction and spread of invasive alien species.*
- EC DIRECTIVE 2009/147/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 November 2009 on the conservation of wild birds
- EC COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on *Our life insurance, our natural capital: an EU biodiversity strategy to 2020*. COM (2011) 244 final.
- CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE AND NATURAL HABITATS Standing Committee (2011). EUROPEAN CODE OF CONDUCT ON PETS AND INVASIVE ALIEN SPECIES. T-PVS/Inf (2011) 1 rev.
- CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE AND NATURAL HABITATS Standing Committee (2017). European Code of Conduct on International Travel and Invasive Alien Species. T-PVS/Inf (2017) 1.
- Bern Convention Group of Experts on Invasive Alien Species (2009). Implementation of recommendations on Invasive Alien Species. Directorate of Culture and of Cultural and Natural Heritage.
- The Convention on Biological Diversity of 5 June 1992 (1760 U.N.T.S. 69)
- EC COMMISSION DELEGATED REGULATION (EU) 2018/968 of 30 April 2018 *supplementing Regulation (EU) No 1143/2014 of the European Parliament and of the Council with regard to risk assessments in relation to invasive alien species.*
- EC COMMISSION IMPLEMENTING REGULATION (EU) 2017/1454 of 10 August 2017 *specifying the technical formats for reporting by the Member States pursuant to Regulation (EU) No 1143/2014 of the European Parliament and of the Council*

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